reduction. Orig. art. has: 3 figures and 17 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 30Nov63 ENCL: 01

SUB CODE: SS, EM NO REF SOV: 008 OTHER: 017

Card 3/4

L 20292-65
ACCESSION NR: AP4042550

ENCLOSURE: 01

0

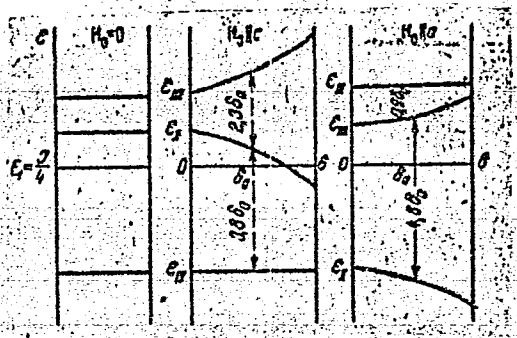


Fig. 1

Energy level scheme of ion pair in state S = 1 as a function of the Zeeman splitting of the isolated ion. The arrows indicate the transitions that play the principal role in the transfer of the

energy from the isolated ions to the lattice

Card 4/4

L 6619-65 EWA(k)/FBD/EWT(l)/EEC(k)-2/K/T/EEC(t)/EEC(b)-2/EWP(k)/EWA(m)-2/EWA(b)/Pn-4/Pc-4/Pf-4/Pi-4/Pl-4 IJP(c)/ASD(d)/AFETR/BSD/ASD(a)-5/AEDC(a)/SSD/AFWL/RAEM(a)/ESD(c)/ESD(gs)/RAEM(t)/ESD(t)

ACCESSION NR: AP4042391 S/0056/64/047/001/0216/0220

AUTHOR: Bunkin, F. V.; Karapetyan, R. V.; Prokhorov, A. M. 90 89

TITLE: Dissociation of molecules in a strong radiation field

SOURCE: Zh. eksper. i teor. fiz., v. 47, no. 1, 1964, 216-220

TOPIC TAGS: dissociation, photodissociation, laser, radiation field, laser application, polar molecule

ABSTRACT: A theoretical investigation has been made of photodissociation of molecules in a strong (laser) radiation field when the photon energy is less than the dissociation energy. Only dissociation due to excitation of high vibrational levels of molecules accompanied by

L 6619-65
ACCESSION NR: AP4042391

ASSOCIATION: Fizicheskiy institut im. Lebedev Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 03Jan64 ATD PRESS: 3094 ENCL: 00

SUB CODE: NP, OP NO REF SOV: 005 OTHER: 001

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001343120012-4

L 18604-65 EWG(j)/EWA(k)/EBD/EWT(1)/EEC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/EWA(m)-2/
EWA(h) Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4/ BSD/AFWL/ASD(a)-5/RAEM(a)/APTC(p)/ASMP-2
AFETR/SSD/ESD(gs)/ESD(t) WG

ACCESSION NR: AP5000364 S/0056/64/047/005/2003/2005

AUTHOR: Mandel'shtam, S. L.; Pashinin, P. P.; Prokhindeyev, A. V.; Prokhorov, A. M.; Sukhodrev, N. K.

TITLE: Investigation of the "spark" created in the air by a focused laser beam

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 5, 1964, 2003-2005

TOPIC TAGS: laser, ruby laser, air breakdown, dielectric breakdown, laser beam spark

ABSTRACT: Experimental investigation of air breakdown in the focus of a Q-switched ruby-laser beam yielded the following preliminary results. The laser, with a 30-megawatt peak power, had an output pulse half-width of 50 μsec, a beam diameter of 12 mm, and an output beam energy of 1.5 J. The elongated spark produced in the air had an axial length of 10—15 mm; the threshold power sufficient to cause such a spark was found to be 5—10 megawatts. The entire air breakdown process was photographed with a high-speed SFR-2 camera at 625,000 frames per second. The resolution thus obtained was, however, inadequate to ana-

Card 1/2

L 18604-65
ACCESSION NR: AP5000364

lyze the most interesting initial period of the discharge. It was found that 40% of the laser-output energy passes through the focal point; the rest is absorbed in a small volume near the focus of the lens. The energy of the laser is liberated in an initial volume estimated at 10^{-4} cm^3. The laser beam creates a radial shock wave which follows the pattern of channel formation in the usual spark discharges. A spectroscopic analysis showed the presence of singly charged NII and OII, as well as atomic nitrogen and an H_α line. In contrast to the spark, that involving the laser is characterized by a strong, continuous background, and by very broad lines, most of which are unresolved multiplets. These characteristics indicate a high electron concentration in the laser spark, reaching $2 \cdot 10^{18}$ cm^{-3}. The spark temperature, computed with a fairly low accuracy was 30,000—60,000K. Orig. art. has: 3 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 03Aug64 ENCL: 00 SUB CODE: EC

NO REF SOV: 004 OTHER: 003 ATD PRESS:
3154

Card 2/2

L 24702-65 EWP(e)/EWT(m)/EWA(h) WH

ACCESSION NR: AP5001825 S/0056/64/047/006/2055/2063

AUTHOR: Manenkov, A. A.; Martirosyan, R. M.; Pimenov, Yu. P.; Prokhorov, A. M.; Sychugov, V. A. 14 13 B

TITLE: Transient processes in three-level radio-frequency masers 25

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 6, 1964, 2055-2063

TOPIC TAGS: maser, three level maser, ruby maser, transient state maser, maser transient effect, paramagnetic maser, rutile maser

ABSTRACT: An investigation is made of transient processes in rf three-level paramagnetic masers. The investigation to a certain extent is also applicable to the optical range. The active substances used were ruby[13] and rutile[15] (TiO_2) doped with Cr^{3+}. The emission from the ruby and rutile masers was in the 21- and 10-cm ranges, respectively. The concentration of Cr^{3+} in ruby was 0.03% and in rutile 0.06%, and both masers operated at a temperature of 4.2K. The experimental results indicate that the steady-state amplitude is reached after a series of transient damped oscillations with subsequent exponential

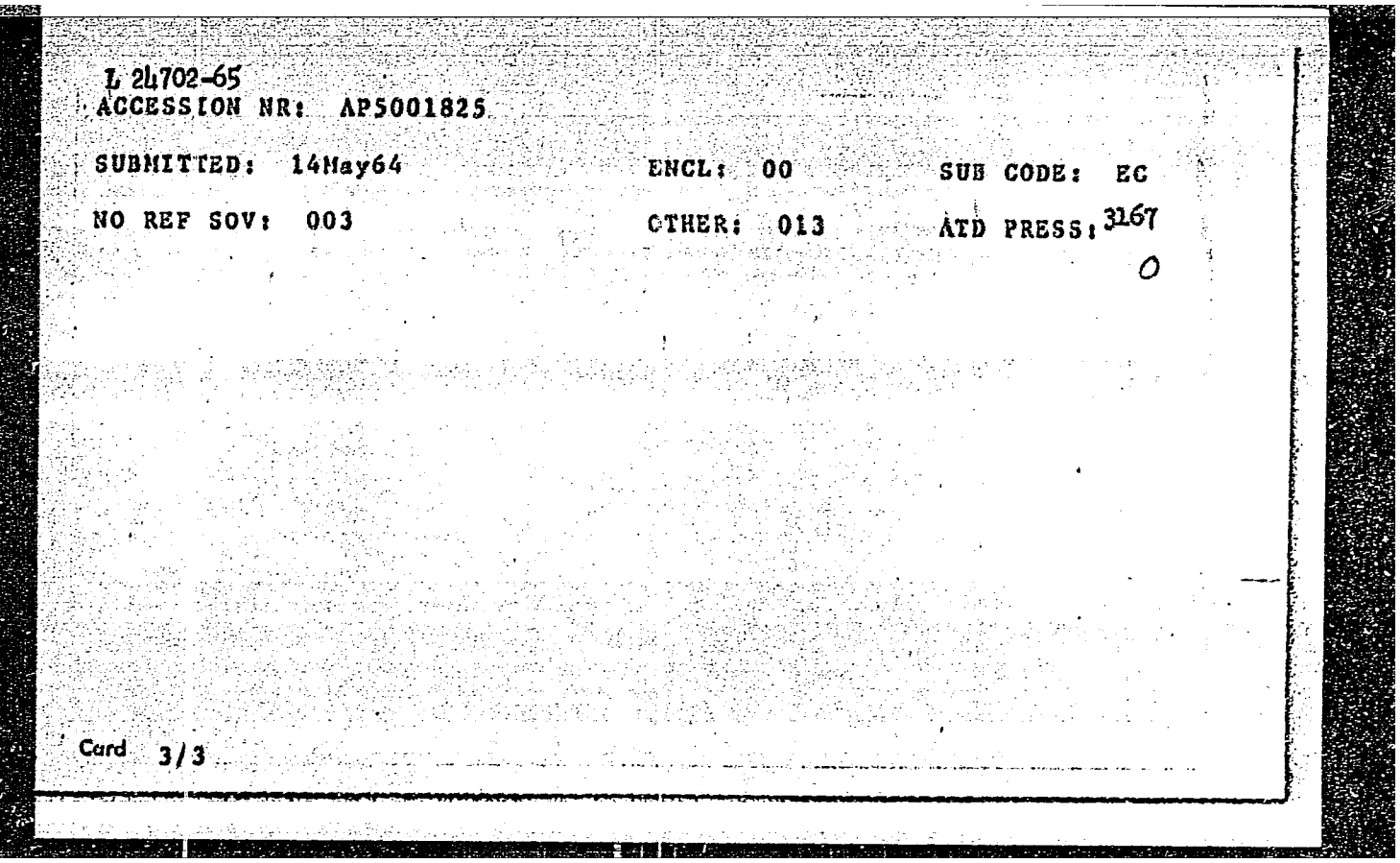
Card 1/3

L 24702-65
ACCESSION NR: AP5001825

attenuation. The differences between the stages of a transient in ruby and rutile masers are discussed. A theoretical analysis of transient processes in masers is carried out on the basis of kinetic equations similar to those used by H. Statz and G. A. de Mars (Quantum Electronics, Columbia University Press, N. Y., 1960, 530 pp.) but generalized for a three-level maser. A solution of a system of nonlinear equations is obtained as a linear approximation in analytical form. The theoretical computations agree well with the experimental data. The results indicate that in a ruby maser oscillations with amplitude equal to, or higher than, the steady state occur. In the case of large deviations of the population and amplitude from the steady-state values, nonlinear effects are very likely to occur. These, in a ruby maser, cause nonsinusoidal oscillations at the start of a transient; the duration of the first peaks is considerably shorter than the duration of those near the steady-state level, where oscillations approach a sinusoidal form. Orig. art. has: 12 formulas and 4 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics, Academy of Sciences, SSSR)

Card 2/3



L 24702-65
ACCESSION NR: AP5001825

SUBMITTED: 14May64 ENCL: 00 SUB CODE: EC

NO REF SOV: 003 OTHER: 013 ATD PRESS: 3167

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Card 3/3

L 27113-65 FBD/EWA(k)/EWG(j)/EWP(e)/EWT(l)/EWT(m)/EEC(k)-2/T/EEC(t)/EWP(k)/EEC(i)-2/EWA(m)-2/EWA(h) Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4 IJP(c) WG/WH
ACCESSION NR: AP4016504 S/0020/64/154/005/1072/1074

AUTHOR: Konyukhov, V. K.; Kulevskiy, L. A.; Prokhorov, A. M. (Corresponding member)

65
64
B

TITLE: Internal types of oscillation in the ruby laser 25

SOURCE: AN SSSR, Doklady*, v. 154, no. 5, 1964, 1072-1074

TOPIC TAGS: ruby laser, laser, internal oscillation, thermal energy, directed emission generation, luminescence, particle loss, chromium, excited level, metastable level transition energy

16

ABSTRACT: The energy of internal types of oscillation in a laser (ruby crystalline rod containing $(3 + 0.5) \times 10^{-2}$ at. % Cr) was determined by analyzing the thermal energy accumulated in the ruby crystal during the time the

Card 1/3

L 27813-65
ACCESSION NR: AP4016504

of directed emission, to the loss of particles with metastable levels to the crystal luminescent glow, and to the generation by internal types of oscillation. The figure shows the heat energy emitted under different operating conditions:

Card 2/4

L 27813-65

ACCESSION NR: AP4016504

art. has: 1 figure and 1 table.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 06Nov63 ENCL: 01

SUB CODE: EC NO REF SOV: 001 OTHER: 001

Card 3/4

ACCESSION NR: AP4036720 S/0020/64/156/002/0298/0299

AUTHOR: Abilov, G. S.; Veselago, V. V.; Prokhorov, A. M. (Corr. member AN SSSR)

TITLE: Passage of electromagnetic waves through bismuth

SOURCE: AN SSSR. Doklady*, v. 156, no. 2, 1964, 298-299

TOPIC TAGS: electromagnetic wave, magnetoplasma oscillation, electromagnetic wave penetration, standing wave, bismuth

ABSTRACT: The possibility of penetration of electromagnetic waves through bismuth was pointed out previously (e.g., E. A. Kauer and V. G. Skobov, ZhETF 45, 1963, 610). It has been previously detected by M. S. Khaykin et al (ZhETF 45, 1963, 1704) by reflection from the resonator in an arrangement for excitation of magnetic plasma oscillations. The present authors have demonstrated the penetration by recording the radiation after passage through the specimen. The apparatus consisted of two strip resonators having a common wall made of a bismuth specimen (23 mm diam, 1.4 mm thick). At 1.8 K, with the apparatus in a magnetic field, the oscillations in the first resonator (9600Mc) produced oscillations in the second

Card 1/2

ACCESSION NR: AP4036720

resonator. The power transmitted depended on the magnetic field strength. In the absence of magnetic field, or during the increase in the specimen temperature up to 4.2K, the penetration of electromagnetic waves was not observed. Orig. art. has: 1 figure.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics, Academy of Sciences SSSR)

SUBMITTED: 18Dec63 ATD PRESS: 3053 ENCL: 00

SUB CODE: EM NO REF SOV: 004 OTHER: 000

Card 2/2

S/0020/64/156/006/1326/1328

ACCESSION NR: AP4041397

AUTHOR: Martirosyan, R. M.; Prokhorov, A. M. (Corresponding member AN SSSR); Sorochenko, R. L.

TITLE: Application of a quantum paramagnetic amplifier in radioastronomy

SOURCE: AN SSSR. Doklady*, v. 156, no. 6, 1964, 1326-1328

TOPIC TAGS: quantum paramagnetic amplifier, radioastronomy, hydrogen line, radio wave fine structure

ABSTRACT: The quantum paramagnetic amplifier (QPA) (see T. V. Jelley, Microwave J. #2 (1962)) consists of two coupled resonance circuits of the signal frequency. It can be used in spectral radioastronomical studies which do not require a broad transmission band. The authors used this amplifier in connection with the 22-meter radio telescope of FIAN for observation of the 21-cm radiation of neutral hydrogen. The active substance is $Al_2O_3:Cr^{3}$ in a perpendicular orientation of the trigonal axis with respect to the external magnetic field of 2000 Oe. The general noise temperature of the system is expressed as a function of the noise temperature of the components. The results indicate that QPA permits obtaining detailed information on the radiation profile (fine structure). Orig. art. has: 3 figures.

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ACCESSION NR: AP4041397

ASSOCIATION: Fizicheskiy institut im P. N. Lebedeva, Akademii nauk SSSR (Institute of Physics, Academy of Sciences SSSR)

SUBMITTED: 13Jan64 ATD PRESS: 3077 ENCL: 00

SUB CODE: EC, AA NO REF SOV: 003 OTHER: 001

Card 2/2

L 13976-65 EWG(j)/EWA(k)/FBD/EWP(e)/EWT(l)/EWT(m)/EEC(k)-2/T/EEC(t)/EWP(k)/EEC(b)-2/EWA(m)-2/EWA(h) Pn-4/Pc-4/Pf-4/Pi-4/Pl-4/Peb AS(mp)-2/AFETR/ESD/ASD(a)-5/AFGC(b)/RAEM(a)/ESD(gs)/ESD(t)/IJP(c) WG/WH

ACCESSION NR: AP4047320 S/0020/64/158/004/0824/0826

AUTHORS: Konyukhov, V. K.; Kulevskiy, L. A.; Sokolov, A. K.; Prokhorov, A. M. (Corresponding member AN SSSR)

TITLE: Spectrum of ruby laser with external spherical mirrors

SOURCE: AN SSSR. Doklady*, v. 158, no. 4, 1964, 824-826

TOPIC TAGS: ruby laser, ruby laser oscillation, laser cavity, laser mirror system

ABSTRACT: The emission spectrum of a ruby laser with external spherical mirrors, operating in uncamped and quasi-stationary generation modes was investigated. A ruby crystal 12 mm in diameter and 120 mm long was used, with its optical axis perpendicular to the geometrical axis of the crystal. The spherical mirrors were 500 in radius and were set at a distance of either 100 mm (concentric cavity) or 500 mm (confocal cavity). The spectrum was time-swept

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L 13976-65
ACCESSION NR: AP4047320

and investigated with a Fabry-Perot interferometer. Unlike a ruby laser with flat mirrors, where several spectral components with randomly varying frequencies are generated simultaneously, a laser with external spherical mirrors emits a single component with width not larger than 0.1 cm^{-1} and with a frequency variation that consists of abrupt jumps imposed on a monotonic decrease. This is attributed to changes in the optical properties of the ruby, due to the increase in its temperatures during the laser operation. Other factors, such as internal stresses, may also influence the frequency variation. "The authors thank T. N. Zubarev for a useful discussion of the work." Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 23May64 ENCL: 00
SUB CODE: EC, OP NR REF SOV: 003 OTHER: 009

APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001343120012-4"

L 1947-66 EWA(k)/FBD/EWT(1)/EEC(k)-2/T/EWP(k)/EWA(m)-2/EWA(h) SCTB/IJP(c)
ACCESSION NR: AT5018647 WG/GS UR/0000/65/000/000/0216/0227

AUTHOR: Prokhorov, A. M. (Corresponding member AN SSSR, Laureate of Lenin Prize, Laureate of Nobel Prize) 44 B+1

TITLE: Quantum electronics

SOURCE: Radio 70 let (Seventy years of radio); nauchno-tekhnicheskiy sbornik. Moscow, Izd-vo Svyaz', 1965, 216-227

TOPIC TAGS: quantum electronics, quantum generator 25

ABSTRACT: Modern quantum-electronic devices, their principles, structural parts, and operation are briefly reviewed: Systems with inversed population, and the principle of stimulated emission. Maser, an elementary description. Ruby quantum amplifiers. Ruby laser, an elementary description. Gas laser. Semiconductor laser. Prospects of laser generators and monochromatic-radiation receivers. The article offers an elementary account of the state of the art. Orig. art. has: 5 figures and 13 formulas.

Card 1/2

L 1947-66
ACCESSION NR: AT5018647

ASSOCIATION: none

SUBMITTED: 04May65 ENCL: 00 SUB CODE: EG

NO REF SOV: 000 OTHER: 000

Card 2/2

L 2994-66

ACCESSION NR: AP5021348 UR/0120/65/000/004/0140/0143
535.853.3-14

50
B

AUTHORS: Dianov, Ye. M.; Irisova, N. A.; Prokhorov, A. M.

TITLE: An arrangement for measuring the coefficients of reflection and transparency of substances operating in monochromatic radiation in the millimeter and submillimeter range

SOURCE: Pribory i tekhnika eksperimenta, no. 4, 1965, 140-143

TOPIC TAGS: short wave radiation, reflected radiation, transmission, glass, plexiglass, polystyrene/K8 glass

ABSTRACT: The authors describe a setup for producing monochromatic radiation in the range of 1—4 mm, designed for measuring the coefficients of reflection and transparency. An electron tube operating in the desired range transmits its radiation along a metallic waveguide to a multiplier head of semiconducting material. The mouth of this device is at the focus of a spherical mirror. The radiation is then directed to a diffraction grating. Depending on the purpose of the experiment, the radiation may then be reflected from another spherical mirror into various optical systems. The principal design of the setup is illustrated in Fig. 1

Card 1/3

L 2934-66

ACCESSION NR: AP5021348

of the Enclosure. The setup makes possible the production of radiation in either converging or parallel beams, and the use of dielectric waveguides permits the radiation to be transmitted to distances of several meters from the device. Preliminary measurements were made on the transparency and reflection of several substances. Coefficients of absorption were found to be $6.8 \cdot 10^{-3}$ and $3.0 \cdot 10^{-2}$ for plexiglass and K-8 glass, respectively, for a wavelength of 2 mm. "The authors thank Ye. N. Bol'shakov for his aid in building the device, Ye. A. Vinogradov for useful discussions, and L. K. Kiselev for participating in the work of setting up the equipment and for adjusting the radio engineering apparatus." Orig. art. has: 3 figures and 1 formula. [04]

ASSOCIATION: Fizicheskiy institut AN SSSR, Moscow (Physical Institute, AN SSSR)

SUBMITTED: 08Jun64 ENCL: 01 SUB CODE: OP, EC

NO REF SOV: 006 OTHER: 002 ATD PRESS: 4109

Card 2/3

L 2994-66

ACCESSION NR: AP5021348 ENCLOSURE: 01

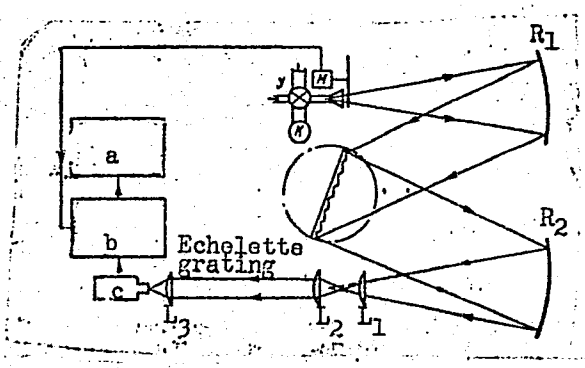

Fig. 1. Setup for measuring reflection and transparency

a - EPP-09 Automatic recorder; b - amplifier and synchronous detector; c - optical acoustical receiver; K - electron tube; Y - multiplier; M - modulator; R_1 and R_2 - spherical mirrors (ϕ = 280 mm, F = 750 mm); L_1, L_2, L_3 - short-focus polystyrene lenses (ϕ = 74 mm, F = 60 mm).

Card 3/3

L 45220-65 EWA(k)/FBD/EWG(r)/EWT(l)/EEC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/EWA(m)-2/EWA(h) Pm-4/Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4 IJP(c) WG

ACCESSION NR: AP5013663 UR/0386/65/001/001/0005/0009

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Prokhorov, A. M.

TITLE: Stimulated emission of CaF_2: Ho^{3+} at λ 5512 Å

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 1, no. 1, 1965, 5-9

TOPIC TAGS: laser, calcium fluoride, calcium fluoride laser, stimulated emission, coherent light fluorite

ABSTRACT: The present article, in the form of a letter to the editors, provides preliminary data on a CaF_2: Ho^{3+} laser operating in the middle of the visible spectral range (at 5512 Å) at a temperature of 77K. The faces of the 7.5-cm-long laser rod were coated with layers of a dielectric material. The diameter of the faces was 6.5 mm and their transmittivity at the oscillation wavelength 0.12 and 0.7%. A xenon lamp was the pumping source. Laser action was achieved in samples with an Ho^{3+} concentration of 0.4%. The oscillation threshold was 1200 J. Stimulated emission was due to transitions between the $5S_2$ level and a Stark component of the 5I level about 370 cm^{-1} above the ground level. The exact wavelength of

stimulated emission was determined to be [illegible]
linewidth was 0.04 Å (0.612 cm^{-1}). Orig. art. has: 3 figures. [CS]
Card 1/2

L 45720-65
ACCESSION NR: AP5013663

2

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR); Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of Moscow State University)

L 58560-65 EWA(k)/FBD/EWG(r)/EWT(1)/EEC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/EED-2/EWA(m)-2/EWA(h) Pm-4/Pn-4/Po-4/Pf-4/Pae-2/Peb/Pi-4/P1-4 IJP(c) CC/WG

ACCESSION NR: AP5013671 UR/0386/65/001/001/0039/0041

AUTHOR: Petrov, Yu. N.; Prokhorov, A. M.

TITLE: 75-micron laser

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 1, no. 1, 1965, 39-41

TOPIC TAGS: laser, ir laser, gas laser, helium xenon laser

ABSTRACT: The authors first discuss qualitatively the feasibility of a laser operating in the far infrared and using a gas dischrge. Although in the design of gas lasers for the far infrared attention is usually paid to close levels of the higher states, it is noted that in Xe overlap of the p and d series takes place even for

Card 1/2

L 58560-65

ACCESSION NR: AP5013671

frequency discharge and with internal confocal silvered mirrors with reflection coefficients 100 and 95%; the substrates were of crystalline quartz. The length of the discharge quartz tube was 1.80 m and the inside diameter was 6 mm. "The

authors are deeply grateful to I. A. Krylov for supplying the far-infrared receiver developed by him."

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 19Feb65 ENCL: 00 SUB CODE: EC

NR REF SOV: 002 OTHER: 003

dm

Card 2/2

SCTB/IJP(c) WG/JD/JG/GG

ACCESSION NR: AP5014193 UR/0386/65/001/002/0003/0007

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Korniyenko, L. S.; Osiko, V. V.; Prokhorov, A. M.; Udovenchik, V. T.

TITLE: Investigation of the stimulated emission in $CaF_2:Nd^{3+}$ crystals (type II) at room temperature

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v radaktsiyu. Prilozheniye, v. 1, no. 2, 1965, 3-7, and insert A

TOPIC TAGS: neodymium, calcium compound, stimulated emission, paramegnetic laser, room temperature laser

ABSTRACT: The present work, a continuation of earlier research (ZhETF, 46, 1964, 386) in which the authors obtained stimulated emission at ~1.047 μ in $CaF_2:Nd^{3+}$ (type I) crystals at 300K, gives preliminary results for laser action at ~1.0885 μ in $CaF_2:Nd^{3+}$ (type II) crystals at 300K. Type II crystals, unlike type I crystals, contain oxygen ions in the structure of their neodymium optical centers. The working crystals, which had 0.2—0.5% Nd^{3+} concentrations, were in the form of cylindrical rods having polished ends with an accuracy of ~15". The diameter and length of the rods were ~6.0 mm and 75 mm, respectively. The optical resonator consisted of externally

Card 1/2

L 58467-65
ACCESSION NR: AP5014193

mounted confocal dielectric mirrors (radius of curvature, 500 mm; diameter, 40 mm; transmittivity, ~2% at 1.06 μ). An IFP-800 xenon lamp was used for pumping. Laser action resulted from the $^4F_{3/2} \rightarrow {}^4I_{11/2}$ transition. The lifetime of the excited $^4F_{3/2}$ state at 300K was measured (by means of a taumeter developed for this purpose) as ~1.25 μsec. At 300K, the type II laser operates at a lower frequency (~1.0885 μ) than any other known neodymium laser. Orig. art. has: 1 table and 3 figures. [YK]

ASSOCIATION: Institut yadernoy fiziki Moskovskogo Gosudarstvennogo universiteta (Institute of Nuclear Physics, Moscow State University); Fizicheskiy institut Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 03Feb65 ENCL: 00 SUB CODE: EC, SS

NO REF SOV: 002 OTHER: 008 ATD PRESS: 4015

Card 2/2

L 4291-65 EWA(k)/FBD/EWG(r)/EWT(l)/EEC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/
EWA(m)-2/EWA(h) Pf-4/Pi-4/Pl-4/Pm-4/Pn-4/Po-4/Peb IJP(c) WG

ACCESSION NR: AP5010042 UR/0368/65/002/002/0138/0141

AUTHOR: Kaminskiy, A. A.; Korniyenko, L. S.; Litvak, D. M.; Osiko, V. A.; Prokhorov, A. M.

TITLE: A $CaF_2:Dy^{2+}$ CW laser pumped by a point-source light

SOURCE: Zhurnal prikladnoy spektroskopii, v. 2, no. 2, 1965, 138-141

TOPIC TAGS: paramagnetic laser, dysprosium doped laser, solid laser, point source pumping, laser pumping, CW laser

ABSTRACT: The design and certain characteristics of a CW $CaF_2:Dy^{2+}$ laser pumped by a point-source are described. A superhigh-pressure continuous xenon lamp, the DKSh-1000, placed in an OKL-3a standard cine projection illuminator, was used as

Card 1/4

L 42951-65

ACCESSION NR: AP5010042

transmissivity of approximately 5%. To reduce scattering, all the condenser sides were silver coated. Stimulated emission of Dy^{2+} in CaF_2 was observed at 23,590 ± 10 and was due to the $^5I_7 \rightarrow {}^5I_8$ transition. The lifetime of the excited $^5I_7$ level at 300K was ~ 120 μsec and at the liquid nitrogen temperature, 14 msec. The beam divergence was approximately 5'. The proposed system utilizes available superbright

ures. [YK]

ASSOCIATION: none

Card 2/4

L 42951-65

ACCESSION NR: AP5010042

SUBMITTED: 03Sep64 ENCL: 01 SUB CODE: EC

NO REF SOV: 000 OTHER: 007 ATD PRESS: 3236

Card 3/4

L 5712-65 EWT(l)/EWT(m)/T/EWP(t)/EEC(b)-2/EWP(b) Pl-4 IJP(c) JD/JG/GG

ACCESSION NR: AP5014227 UR/0386/65/001/004/0033/0039

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Prokhorov, A. M. 46 43 B

TITLE: Selective excitation of rare-earth ion centers in crystals 21

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 1, no. 4, 1965, 33-39

TOPIC TAGS: laser material, rare earth, absorption spectrum, Stark effect

ABSTRACT: The active medium in most solid-state lasers today is a crystal doped with rare-earth ions. For various reasons such crystals behave quite differently, and this study analyzes rare-earth active centers to determine the most desirable types. A method is proposed for studying the Stark structure of the luminescence spectra of rare-earth doped crystals (in this case CaF_2-Er^{3+}) in which the individual types of centers are selectively excited. The experimental equipment consists of a mercury lamp, lenses, monochromator, glass Dewar, quartz light conductors, test sample, prism, and a spectrograph. The monochromator is capable of selecting a band with half-width of ~3 Å from a continuous spectrum.

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L 57129-65

ACCESSION NR: AP5014227

3

Both static and dynamic methods are used in producing excitation: in the first, excitation is produced in a preselected absorption line; in the second, the wavelengths of the excitation light are scanned. The dynamic luminescence spectrum for one transition at 77°K of CaF_2 doped with 3% Er^{3+} is shown, and the related absorption spectrum is compared. Three different Er^{3+} centers were studied, and excitation in each line of these systems was found to produce identical luminescence spectra. A typical microphotogram is shown and discussed, and the systems are compared. This is claimed to be the first use of selective excitation for Stark structure analysis of luminescence spectra of rare-earth ions in crystals. "The authors express their appreciation to V. B. Aleksandrov for his participation in the experiment." Orig. art. has: 3 figures. [14]

ASSOCIATION: Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR); Institut kristallografii Akademii nauk SSSR (Institute of Crystallography, Academy of Sciences, SSSR)

SUBMITTED: 16Apr65 ENCL: 00 SUB CODE: EC, SS

NO REF SOV: 000 OTHER: 000 ATD PRESS: 4036

Card 2/2

L 8524-66
ACC NR: AT5027523 SOURCE CODE: UR/2690/65/008/000/0123/0130

AUTHOR: Khayrullin, G.G.; Prokhorov, A.N.

ORG: Institute of Electronics and Computer Technology AN LatSSR, Riga (Institut elektroniki i vychislitel'noy tekhniki AN LatSSR)

TITLE: Protection, control, and failure indication on semiconductor unit reliability testing stands

SOURCE: AN LatSSR. Institut elektroniki i vychislitel'noy tekhniki. Trudy, v. 8, 1965. Avtomatiki i vychislitel'naya tekhnika, 123-130

TOPIC TAGS: test stand, semiconductor device, circuit reliability, reliability engineering

ABSTRACT: Complex circuit malfunctioning is usually caused by the failure of one of the circuit components. Component failures are most often caused by short circuits or breaks. The article discusses the consequences of such failures and presents specific circuits for the protection, control, and failure indication on semiconductor unit reliability testing stands. The system incorporates 1) a short circuit protection and indication circuit; 2) a power supply voltage surge protection circuit; 3) a maximum voltage limiter; 4) a current and voltage overload circuit; and 5) a pulse generator malfunction indicator. A design for the overall protection of the entire testing stand is also presented. Orig. art. has: 1 formula and 7 figures.

SUB CODE: EC, IE / SUBM DATE: none / ORIG REF: 004

UDC: 621.316.925:621.382.019.34

Card 1/1

L 4420-66 FBD/EWT(1)/EWA(h) GW/WS-2

ACCESSION NR: AP5022793 UR/0141/65/008/004/0699/0703
539.28.078:523.164

AUTHOR: Martirosyan, R. M.; Prokhorov, A. M.; Sorochenko, R. L.

TITLE: Radio spectrometer for 21-cm wavelength with paramagnetic amplifier

SOURCE: IVUZ. Radiofizika, v. 8, no. 4, 1965, 699-703

TOPIC TAGS: radio spectroscope, radio astronomy, quantum device, amplifier stage, paremagnetic ion, hydrogen line, maser

ABSTRACT: The authors describe a spectrometer intended for the investigation of the hydrogen radio lines, using a paramagnetic amplifier with two coupled 1420-Mc quarter-wave strip resonators. Ruby with 0.04% Cr^{3+} concentration was used as the active medium. An external field of 2000 oe was produced by a superconducting solenoid with winding of pure niobium. The gain of the amplifier when working with a radiometer was 16—18 db at a bandwidth of 7—8 Mc. The gain drift after 30 minutes of operation did not exceed 2—3%. A block diagram of the radiospectrometer is shown in Fig. 1 of the Enclosure. Modulation was by switching the input of the paramagnetic amplifier from the antenna to a dummy resistor equal to

Card 1/3

L 4420-66

ACCESSION NR: AP5022793

the wave resistance of the coaxial line. The amplifier was switched to the radiometer circuit with the aid of a circulator with 0.2 and 20 db loss in the forward and backward directions, backed up by a ferrite gate for better decoupling. The stabilization and calibration of the equipment is briefly described. Tests have demonstrated the ability of the apparatus to disclose fine details in the radio line profile. Orig. art. has: 3 figures. [02]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute, AN SSSR) 55

SUBMITTED: 30Jul64 ENCL: 01 SUB CODE: NP, AA

NO REF SOV: 005 OTHER: 003 ATD PRESS: 4125

Card 2/3

L 4420-66
ACCESSION NR: AP5022793

ENCLOSURE: 01

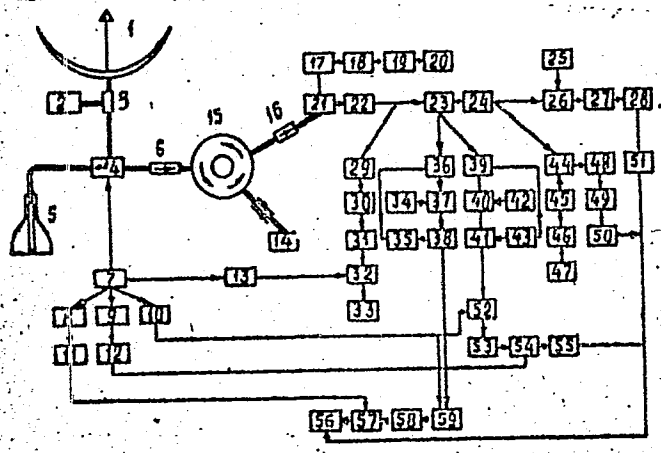

Fig. 1. Radiospectrometer block diagram

1 - Antenna; 2 - noise gen.; 3 - directional coupler; 4 - modulator; 5 - Dewar with dummy load; 6,16 - ferrite gates; 7 - modulation freq. gen.; 8.,9,13 - phase shifters; 10,11, 12 - pulse shapers; 14 - quant. paramag. ampl.; 15 - circulator; 17 - freq. quadrupler; 18 - 108x freq. multiplier; 19 - buffer; 20 - first heterodyne gen.; 21 - first mixer; 22 - if ampl.; 23 - second mixer; 24 - contin. tuning heterod.; 25 - 1000 kcs timer gen.; 26 - mixer; 27 - 250-kcs ampl.; 28 - detector; 29, 30 - suppl. ampl. and broadband output detector; 31, 32, 33 - modul. freq. ampl, synch. detector, and broadb. output recorder; 24, 42 - 3d heterod. of narrow band outputs; 36,39 - 2d if amplif.; 35, 43 - agc; 37, 40 - 3d mixers; 38, 41 - quartz filters; 44 - 10 kcs timing pulse mixer; 45 - harmonics group ampl.; 46 - narrow pulse shaper; 47 - 20 kcs gen.; 48 - 5 kcs ampl.; 49 - detector; 51 - timing relay; 52,59 - narrow band chann. detect.; 53,58 - modul. freq. ampl.; 54, 47 - synch. det.; 55, 56 - narrow band channel recorders.

Card 3/3

L 2329-66 EWA(k)/FBD/EWT(1)/EWT(m)/EPF(c)/EEC(k)-2/T/EWP(t)/EWP(k)/EWP(b)/
EWA(m)-2/EWA(h) SCTB/IJP(c) WG/JD/JW/JG

ACCESSION NR: AP5024560 UR/0070/65/010/005/0746/0747
548.0

62
56
B

AUTHOR: Bagdasarov, Kh. S.; Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Prokhorov, A. M.
44 44 44 44 44

TITLE: Stimulated emission of neodymium-doped yttrofluorite at room temperature

SOURCE: Kristallografiya, v. 10, no. 5, 1965, 746-747, and top half of insert facing p. 743

TOPIC TAGS: solid state laser, neodymium, yttrofluorite, stimulated emission
25,44

ABSTRACT: Certain basic characteristics of a neodymium-doped yttrofluorite (CaF_2—YF_3) laser operating at room temperature on two wavelengths are described. The present work is part of a study to improve the optical properties of active materials for fluorine-compound lasers. Type I CaF_2—YF_3 crystals with 0.1—0.5% (by weight) concentrations of Nd^{3+} were used. Generation at ∿10461 and ∿10640 Å corresponded to threshold energies of ∿130 and ∿35 j, respectively, supplied to a standard IFP-800 xenon flashlamp. The flashlamp was surrounded by a tubular glass (ZLS-17) filter in order to prevent undesirable aging of the neodymium. The space between the flashlamp and filter was filled with cooling water. The working crystals

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L 2329-66 6
ACCESSION NR: AP5024560

were in the form of cylindrical rods with polished ends (parallel within 10—20"), each ~75 mm long and ~6.5 mm in diameter. Confocal external mirrors were used which had an ~0.9% transmission at 1.06 μ. The mirrors were 20 mm in diameter and had a radius of curvature of 500 mm. The linewidths at ~10461 Å and ~10640 Å were ~0.8 cm^{-1} and ~3 cm^{-1}, respectively, at 300K. The most intense luminescence was due to the $^4F_{3/2} \rightarrow {}^4I_{11/2}$ transition, and the lifetime of the excited $^4F_{3/2}$ state of a CaF_2—YF_3 crystal with a 0.5% Nd^{3+} concentration at 300K was ~1 msec. The results show further that the generation in the described system occurs at a considerably lower threshold than in the case of known crystals based on fluorine compounds. Among previously investigated active media, only $CaWO_4:Nd^{3+}$ and $Gd_2O_3:Nd^{3+}$ are known to lase at two wavelengths at 300K with lower thresholds. Orig. art. has: 3 figures. [YK]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva (Physics Institute); Institut kristallografii AN SSSR (Institute of Crystallography, AN SSSR)

SUBMITTED: 07May65 ENCL: 00 SUB CODE: EC

NO REF SOV: 004 27 OTHER: 002 ATD PRESS: 4107

Rare Earth Compounds

Card 2/2

L 52693-65 EWA(k)/FBD/EWG(r)/EWT(1)/EEC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/EWA(m)-2/EWA(h) Pm-4/Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4 SCTB/IJP(c) WG

ACCESSION NR: AP5013332 UR/0109/65/010/005/0788/0803

65
B

AUTHOR: Zverev, G. M.; Prokhorov, A. M.; Shevchenko, A. K. 25

TITLE: Paramagnetic amplifiers and generators with optical pumping (Review) 25

SOURCE: Radiotekhnika i elektronika, v. 10, no. 5, 1965, 788-803

TOPIC TAGS: paramagnetic amplifier, paramagnetic generator, optical pumping, ruby laser, paramagnetic laser, gallium arsenide laser

ABSTRACT: Based on twelve 1954-64 Soviet publications and twenty-two 1956-64 Western sources, this review of quantum paramagnetic amplifiers (QPA) and quantum paramagnetic generators (QPG) consists of these sections: special features of using

L 52693-65
ACCESSION NR: AP5013332

drawn: (1) QPA and QPG with OP extend the quantum-device range down to the submillimeter band; (2) Low temperatures are required for the steady-state operation of QPA and QPG; OP power may be reduced to 0.1 w; (3) Inversion can be obtained with $h\nu_c / kT < 0{,}69$, i.e., with rather high temperatures under pulsed conditions and a constant magnetic field; (4) Cramers' doublets having a high relaxation time are most suitable for obtaining inversion of populations; (5) Absorption in the crystal lattices will not preclude constructing QPA and QPG

ASSOCIATION: none

SUBMITTED: 31Mar64 ENCL: 00 SUB CODE: EC

NO REF SOV: 012 OTHER: 022 ATD PRESS: 4013

BAB
Card 2/2

L 35613-65 EWT(m)/EWP(j)/T/EWP(t)/EWP(b) Pc-4 IJP(c) m/ma/bu

spectra of the indicated six compounds were investigated. Typical data on the frequencies and relative intensities at the maxima of the most intense luminescence lines are listed in Table 1 of the Enclosure. The line widths given are for a temperature -150C, when the intensity of luminescence increases noticeably. The coefficients of negative absorption were estimated from the absolute luminescence brightness of the investigated substance by comparing the luminescence intensity with the radiation intensity of a source with known absolute brightness at the same wavelength. The results are listed in Table 2 of the Enclosure. It is pointed out that the data depend on various experimental conditions. In the case of the complex $Eu(BA)_3$, a spiked generation mode could be attained with a 1200 Joule pump power. "The authors are grateful to V. V. Kuznetsova and L. A. Novikova for synthesis and supply of some of the investigated compounds." Orig. art. has: 4 figures, 1 formula, and 2 tables. [02]

L 25284-65 EWG(j)/EWA(k)/FBD/EWT(l)/EWP(e)/EPC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/EWT(m)/EWA(m)-2/EWA(h) Pn-4/Po-4/Pf-4/Pi-4/Pl-4/Peb IJP(c) WG/WH

ACCESSION NR: AP5004381 S/0056/65/048/001/0106/0110

AUTHOR: Gvaladze, T. V.; Krasyuk, I. K.; Pashinin, P. P.; Prokhindeyev, A. V.; Prokhorov, A. M.

TITLE: Characteristics of a ruby laser with pulsed Q-modulation

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 1, 1965, 106-110

TOPIC TAGS: ruby laser, laser, Q modulation, Q spoiler, laser experiment, laser beam spectroscopy, laser induced air breakdown

ABSTRACT: An experimental study has been made of a ruby laser with an output power of up to 50 Mw for a pulse length of 40—50 nanoseconds. The ruby rod was 115 mm long, 12 mm in diameter, water cooled, and coated at the ends. The Q-modulator was a total-internal-reflection prism rotating at 425 rps. The semitransparent mirror was of the chemically deposited dielectric type, with reflection coefficient varying from 70 to 16% (substrate without coating). High-power pumping produced two separate output pulses. Gain was plotted as a function of pumping energy, using an elliptical reflector and an IFP-5000 lamp. The value of gain was determined with respect to the threshold power and various reflection coefficients

L 25284-65

ACCESSION NR: AP5004381

of the mirrors without the Q-spoiler. It was possible to obtain a gain over 0.25 cm^{-1} in the central regions of the crystal with coated ends. Using the Q-spoiler, maximum energy per pulse was obtained with a K-8 glass substrate without dielectric coating for the mirror. The experiment thus confirmed the theoretical conclusion that high-transmittivity mirrors are preferable if gain is large enough and internal losses small. The spectrum of the laser output beam consisted of from 1 to 7 narrow lines, some of which broadened to a maximum of 0.15 cm^{-1} with increased pump power. The total width of the spectrum was 1.5 cm^{-1} at low power, and narrowed down to a mean of 0.6 cm^{-1} at higher power. A mirror substrate less than 3 mm thick produced a single line 0.1 cm^{-1} wide with very good directivity. This is considered one of the most convenient methods of producing narrow-line giant pulses at room temperature. Focusing of the beam in air produced a spark at output powers of 5—10 Mw. An uncoated mirror impervious to burnout was used in the spark experiments. Orig. art. has: 10 formulas and 1 figure. [SK]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 18Jul64 ENCL: 00 SUB CODE: EC

NO REF SOV: 004 OTHER: 006 ATD PRESS: 3184

Card 2/2

L 35506-65 EEC(b)-2/EWG(j)/EEC(k)-2/EWA(h)/EWA(k)/EWP(k)/EWT(l)/EWT(m)/EEC(t)/PBD/EWP(b)/T/EWA(m)-2/EWP(t) Pz-4/Pi-4/Pl-4/Pn-4/Po-4/Peb IJP(c) MC/JD/JG

ACCESSION NR: AP5006495 S/0056/65/048/002/0476/0482

AUTHOR: Kaminskiy, A. A.; Korniyenko, L. S.; Prokhorov, A. M. 67 64 B

TITLE: A spectral study of stimulated emission from Nd^{3+} in CaF_2

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 2, 1965, 476-482

TOPIC TAGS: stimulated emission, neodymium, fluorite, electron paramagnetic resonance, crystal field symmetry, laser, neodymium laser 21 25

ABSTRACT: Following earlier investigations of the induced emission from the

$$^4F_{3/2} \rightarrow {}^4I_{11/2}$$

transition of Nd^{3+} in CaF_2 at 77K (L. F. Johnson, J. Appl. Phys. v. 38, 756, 1962) and at room temperature (ZhETF v. 46, 386, 1964), the authors report experimental results of a spectral study of this stimulated emission at temperatures from 300 to 15K. Emission was investigated in crystals with Nd^{3+} ion concentrations from 0.02 to 0.7% grown from a melt in a fluorine atmosphere by the method of lowering the cruci-

ble. Whereas only one line was observed in earlier research, five new lines were ob-

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L 35506-65

ACCESSION NR: AP5006495

2

served below 100K in the present investigation. The exciting light was supplied by a xenon flash lamp, the ultraviolet radiation from which was cut off with a yellow filter. The spectrum was recorded with a spectrograph with a grating of 1200 lines/mm, the long-range band of which extended to 1.07 μ. The wavelength could be measured with accuracy ± 0.1 Å. The stimulated emission was detected with a photomultiplier with oxygen-cesium photocathode. Crystals 75 mm long and 6.5 mm in diameter with polished cylindrical side surfaces were used in the investigations. The cavity consisted of a crystal coated with 13-layer dielectric mirrors. Only one line, 10461 Å, was observed at 300K for all the crystals, except those with an Nd^{3+} concentration of approximately 0.02%. The additional lines had wavelengths of 10448.2, 10466.6, 10480.8, 10507.9, and 10650.1 Å (there were slight variations in these values from crystal to crystal). The line widths ranged from 0.1 to 0.9 cm^{-1}, and increased by approximately 2.5 times as the concentration increased from 0.07 to 0.7%. The results were compared with data on the EPR of the Nd^{3+} ion, and it is shown from the EPR data that as the Nd^{3+} concentration is increased, a rhombic symmetry becomes superimposed on the original tetragonal symmetry of the environment of the ion. Some of the additional lines observed in the crystal can be attributed to the influence of this symmetry. It is also shown that emission from the upper and lower levels is governed by the rhombic and tetragonal symmetries, respectively. "The authors thank L. V. Makarenko for great help with the experiments and V. V. Osiko for fruitful discussions and for providing the crystals." Orig. art. has: 6 figures and 1 table.

[02]

Card 2/3

L 35506-65

ACCESSION NR: AP5006495

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics of the Moscow State University)

SUBMITTED: 03Sep64 ENCL: 00 SUB CODE: SS, OP

NO REF SOV: 003 OTHER: 001 ATD PRESS: 3215

Card 3/3

L 45640-65 EEC(b)-2/EWG(r)/EEC(k)-2/EWA(h)/EWA(k)/EWP(k)/EWT(l)/EEC(t)/FBD/T/EWA(m)-2 Pf-4/Pi-4/Pl-4/Pm-4/Pn-4/Po-4/Peb SCTB/IJP(c) WG

ACCESSION NR: AP5010503 UR/0056/65/048/004/1084/1086

AUTHOR: Bunkin, F. V.; Prokhorov, A. M.

TITLE: The effect of multiphoton processes in limiting the maximum power output of lasers

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 4, 1965, 1084-1086

TOPIC TAGS: laser, stimulated emission, nonlinear optics, multiphoton transition, ruby laser, GaAs laser, semiconductor laser, injection laser, junction laser

ABSTRACT: It is pointed out that an inverted population can be attained only in respect to one transition or to a group of a few transitions. Since the probability of a one-photon transition responsible for the achievement of population

intensity that can be obtained in the [illegible]

Card 1/2

L 45640-65

ACCESSION NR: AP5010503

~5 x 10^5 v/cm, corresponding to a GaAs laser maximum output power of 10 kw. The maximum power output of a ruby laser limited by multiphoton transitions was found to be 2 x 10^5 mw. Therefore, as a result of the limitation imposed by multiphoton [illegible] output of a ruby laser per unit volume of laser [illegible]

transitions, the [illegible] [CS]
material should be about a thousand times greater than that of [illegible]
laser. Orig. art. has: 6 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute of the Academy of Sciences, SSSR)

SUBMITTED: 10Jul64 ENCL: 00 SUB CODE: EC

NO REF SOV: 003 OTHER: 001 ATD PRESS: 3244

Card 2/2 mb

L 18094-65 EWA(k)/FBD/EWG(r)/EWT(l)/EEC(k)-2/EEC(t)/T/EEC(b)-2/EWP(k)/EWA(m)-2/EWA(h) Pm-4/Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4 SCIB/IJP(c) WG

ACCESSION NR: AP5013884 UR/0056/65/048/005/1262/1266

AUTHOR: Kaminskiy, A. A.; Korniyenko, L. S.; Prokhorov, A. M. 65 64 B

TITLE: Lifetime of the $^4F_{3/2}$ excited state of a Nd^{3+} ion in CaF_2 and $CaWO_4$ 21

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 5, 1965, 1262-1266

TOPIC TAGS: ion lifetime, excited ion, trivalent neodymium, taumeter, radiationless transition, CaF_2, $CaWO_4$, paramagnetic laser 25

ABSTRACT: An experimental study of the lifetime of the excited $^4F_{3/2}$ state of a Nd^{3+} ion in CaF_2 and $CaWO_4$ crystals was made in the 300—4.2K temperature range and for various concentrations of Nd^{3+} ranging from several thousandths percent to a few percent. In view of the fact that CaF_2 and $CaWO_4$ crystals are used for lasers operating at room temperature, analysis was made of the effect of nonradiative transitions on the reduction of lifetime of the excited $^4F_{3/2}$ level. Experiments were carried out by means of a taumeter (fully described in the article) in which rapid changing of crystals and control of temperature are possible. The experimental results, shown in Figs. 1 and 2 of the Enclosure, indicate the following: 1) an increase in the concentration of Nd^{3+} ions in CaF_2 causes a reduction in the

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ACCESSION NR: AP5013884

lifetime of the excited ^4F level for both types of spectra, the tetragonal and rhombic. This reduction is noticeable particularly at Nd^{3+} concentrations in excess of 0.7%, and in the case of $CaWO_4$ crystals, it is further displayed in the direction of higher concentrations; 2) nonradiative transitions which occur in CaF_2 crystals at room temperatures are of importance as they are responsible for a noticeable reduction in the lifetimes of spontaneous transitions. For CaF_2 crystals at the (liquid) nitrogen and lower temperatures and for $CaWO_4$ crystals at all temperatures, the lifetime of the excited $^4F_{3/2}$ state is determined by the spontaneous emission only. Orig. art. has: 1 equation and 5 figures. [YK]

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Nuclear Physics Institute, Moscow State University)

SUBMITTED: 30Dec64 ENCL: 02 SUB CODE: NP, EC

NO REF SOV: 003 OTHER: 001 ATD PRESS: 4002

Card 2/4

L 43094-65

ACCESSION NR: AP5013884

ENCLOSURE: 01

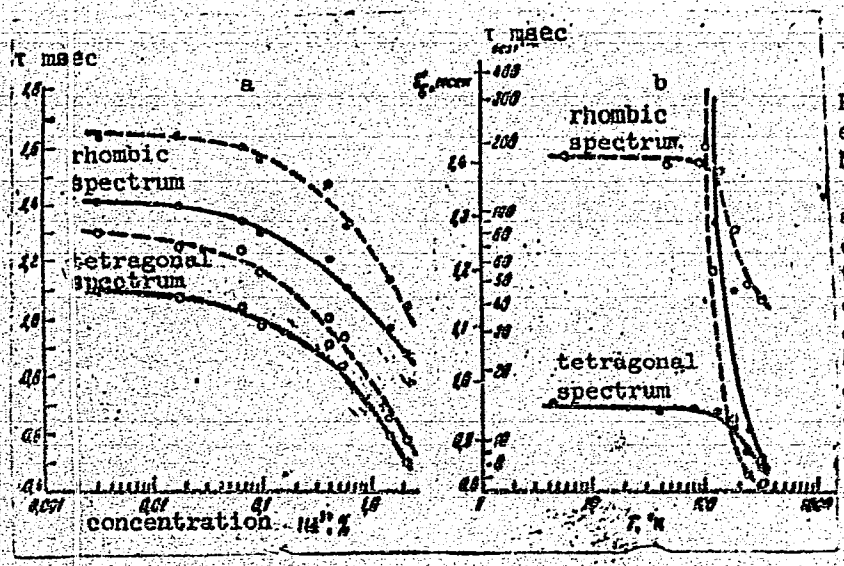

Fig. 1. Lifetime of excited $^4F_{3/2}$ state of Nd^{3+} ion in CaF_2:

a - as a function of concentration of active centers (continuous line corresponds to 300 K, dotted line - 77 and 4.2 K); b - as a function of temperature at Nd^{3+} concentration of 0.4%.

Card 3/4

L 48[illegible]-65

ACCESSION NR: AP5013884

ENCLOSURE: 02

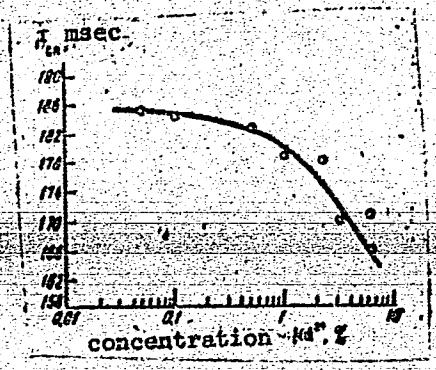

Fig. 2. Lifetime of excited $^4F_{3/2}$ state of Nd^{3+} ion in $CaWO_4$ as a function of temperature.

Card 4/4

L 59519-65 EWA(k)/FBD/EWG(r)/EWT(l)/EEC(k)-2/T/EEC(b)-2/EWP(k)/EWA(m)-2/
EWA(l) Pm-4/Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4 SCTB/IJP(c) WG

ACCESSION NR: AP5016541 UR/0056/65/048/006/1529/1532

64
62
B

AUTHOR: Voron'ko, Yu. K.; Zverev, G. M.; Prokhorov, A. M.

TITLE: Stimulated emission from Er^{3+} ions in CaF_2

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 6, 1965, 1529-1532

TOPIC TAGS: stimulated emission, fluorite, erbium ion, laser action, laser, calcium fluoride

ABSTRACT: The authors obtained stimulated emission from Er^{3+} ions in CaF_2 crystal at three wavelengths in the region of 1.7 μ, and also near 1.26 μ. No emission was obtained near 1.6 μ, as reported by other workers. The investigated CaF_2 single crystal, containing 0.1% erbium, was grown by lowering the crucible in a fluorizing

temperature in crystals 60 mm long and 6 mm in diameter, with silvered ends. Ex-

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L 59519-65
ACCESSION NR: AP5016541

citation was provided by a xenon flash lamp. At about 1000 j threshold energy emission occurred at 1.715 and 1.726 μ. When excitation was increased by a factor of 2 above threshold, emission occurred at 1.696 and also at 1.26 μ. To identify the possible laser mechanism, experiments were made with filtered pump light. These experiments showed that the laser action at 1.7 μ is due to the $^4S'_{3/2} \rightarrow {}^4I'_{9/2}$ transition of Er^{3+}. Laser action at 1.26 μ involves transition between the

authors thank V. V. Osiko for a valuable discussion." Orig. art. has: 3 figures and 1 table. [02]

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics, Moscow State University)

SUBMITTED: 23Jun64 ENCL: 00 SUB CODE: EC, SS

NO REF SOV: 000 OTHER: 002 ATD PRESS: 4054

Card 2/2

ACCESSION NR: AP5019213 UR/0056/65/049/001/0031/0035

AUTHOR: Kaminskiy, A. A.; Korniyenko, L. S.; Maksimova, G. V.; Osiko, V. V.; Prokhorov, A. M.; Shipulo, G. P.

TITLE: CW $CaWO_4:ND^{3+}$ laser operating at room temperature

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 1, 1965, 31-35

TOPIC TAGS: CW laser, neodymium laser, glass laser, room temperature laser, water cooled laser

ABSTRACT: The design and fundamental characteristics of a CW neodymium-doped $CaWO_4$ water-cooled laser, operating at room temperature, are described in detail. Single crystals were grown by the Czochralski method. The $CaWO_4$ mixture was prepared by sedimentation. The starting materials were ammonium paratungstate and calcium chloride, specially refined for this purpose. The neodymium was introduced in the form of a binary salt $NaNd(WO_4)_2$. Na_2WO_4 was introduced into the melt in a concen-

Card 1/2

L 62763-65

ACCESSION NR: AP5019213

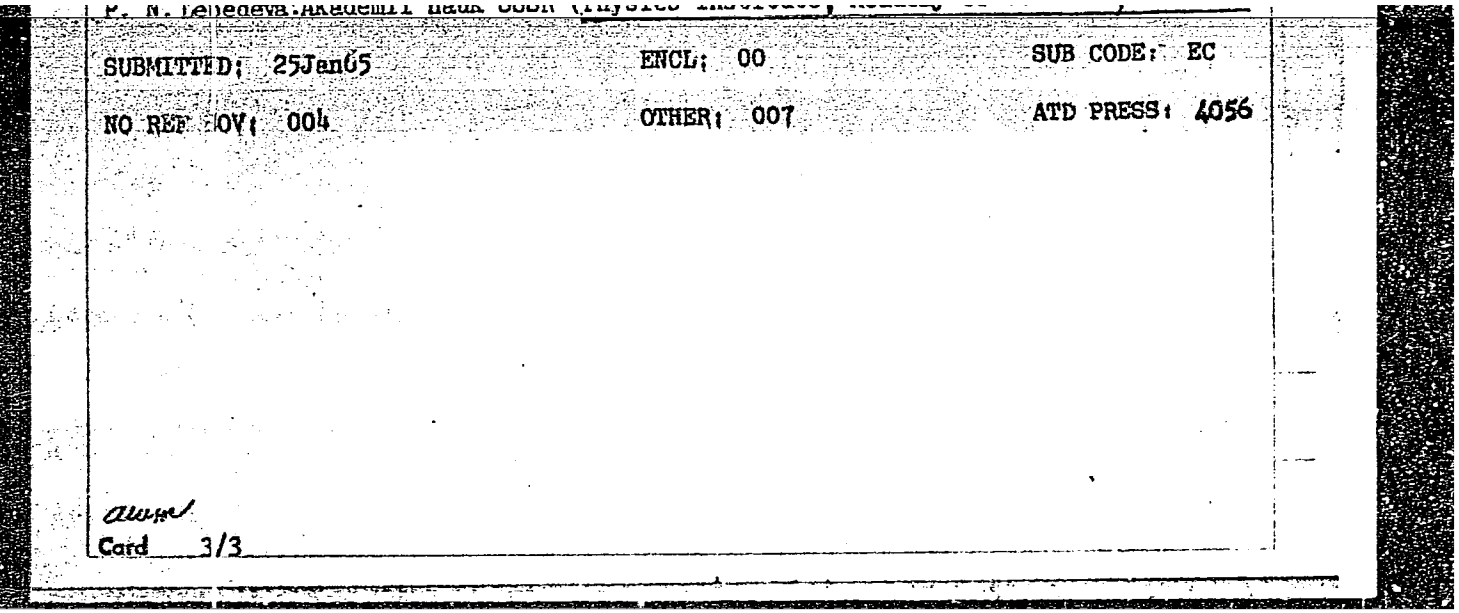
Reduction of the growth rate from 12 to 7 mm/hr led to significant improvement in the optical quality of the crystal. The infrared luminescence of the neodymium ions due to transitions from the $^4F_{3/2}$ level to the different levels of the ^4I multiplet (the most intense luminescence being at 1.06 μ, which corresponds to the transition $^4F_{3/2} \rightarrow {}^4I_{11/2}$) and its absorption spectrum were considered. A crystal 5 mm in diameter and 42 mm long with an Nd^{3+} concentration of about 3.0 percent, was selected for the laser. The lifetime of the excited state $^4F_{3/2}$ of this crystal at room temperature and lower was 172 ±2 μsec. A xenon lamp was placed at one focal point of an elliptical reflector, while the working crystal (ZhS-17 glass) was placed at the other. The optical resonator consisted of multilayer dielectric mirrors placed at the confocal ends of the crystal. The laser operated at λ = 10,584 Å with a line width of approximately 1 Å. The laser action was sustained at a pumping power of 2.6 kw, and a 40% increase in the threshold power resulted in a laser output of several tens of mw with a 1° beam divergence. The threshold of the working crystal pulse excited by a 2.6-kw pumping source was 2 j. Basic difficulties in constructing

art. has: 5 figures. [YK]

Card 2/3

L 62763-65
ACCESSION NR: AP5019213

ASSOCIATION: Institut yaderney fiziki Moskovskogo gosudarstvennogo universiteta (Institute of Nuclear Physics, Moscow State University); Fizicheskiy institut im.



P. N. Lebedev Akademii nauk SSSR (Physics Institute)

SUBMITTED: 25Jan65 ENCL: 00 SUB CODE: EC

NO REF SOV: 004 OTHER: 007 ATD PRESS: 4056

Card 3/3

L 62764-65 EWA(k)/FBD/EWG(r)/EWT(l)/EEC(k)-2/T/EEC(b)-2/EWP(k)/EWA(m)-2/EWA(h) Pm-4/Pn-4/Po-4/Pf-4/Peb/Pi-4/Pl-4 SCIB/IJP(c) WG

ACCESSION NR: AP5019225 UR/0056/65/049/001/0127/0134 67 66 B

AUTHOR: Mandel'shtam, S. L.; Pashinin, P. P.; Prokhorov, A. M.; Rayzer, Yu. P.; Sukhodrev, N. K. 25

TITLE: Investigation of a spark in the air due to a focused laser beam. II

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 1, 1965, 127-134

TOPIC TAGS: gas breakdown, air breakdown, plasma heating, Doppler shift, laser beam scattering

ABSTRACT: This article is a continuation of an earlier work (S. L. Mandel'shtam, P. P. Pashinin, A. V. Prokhindeyev, A. M. Prokhorov, and N. K. Sukhodrev, ZhETF, 47, 2003, 1964), and presents the results of an experimental investigation of the initial shape of the laser-induced air breakdown. A 2—2.5-j ruby laser with a Q-switch (40 nanosecond duration) was used. The plasma temperature produced in the focal region was determined on the basis of the recombination radiation spectrum in the soft x-ray range ($\lambda \sim 10$ Å) and was found to be 50—60 ev. The measurements were made by means of photon counters with aluminum and beryllium windows 3 and 8 mm in diameter, respectively. A study of laser emission scattered on plasma in-

Card 1/2

ACCESSION NR: AP5019225

dicated that the ionization front moves toward the focusing lens with a velocity of $\sim 10^7$ cm/sec measured on the basis of the Doppler shift of the scattered light. The motion of the ionized region under these conditions can be explained in terms of three mechanisms: 1) the hydrodynamic mechanism, 2) the light mechanism, and 3) the successive breakdown mechanism. All three mechanisms were fully discussed by Rayzer in an earlier article (ZhETF, 48, 1508, 1965). Under the experimental conditions in this work, the first mechanism is considered the most probable. Values for the velocity of the detonation wave front (105 and 133 km/sec) and the plasma temperature behind the plasma ($\sim 910.10^3$ and 720.10^7 K), respectively, estimated on the basis of this mechanism are in satisfactory agreement with the experimental data. Orig. art. has: 1 table, 5 figures, and 7 formulas. [YK]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics

L 1772-66 EWA(k)/FBD/EWT(l)/EWP(e)/EWT(m)/EWP(i)/EEC(k)-2/T/EWP(k)/EWA(m)-2/
EWA(h) SCTB/IJP(c) WG/WH

ACCESSION NR: AP5024687 UR/0056/65/049/003/0720/0723

AUTHOR: Zolotov, Ye. M.; Prokhorov, A. M.; Shipulo, G. P.

TITLE: Luminescence and generation in $CaF_2:Dy^{2+}$ excited by a ruby laser

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 3, 1965, 720-723

TOPIC TAGS: laser, stimulated emission, ruby laser, optical excitation, light modulation

ABSTRACT: Laser action at $\lambda \approx 2.36\mu$ is reported in CaF_2 doped with 0.03% Dy^{2+} at a temperature of 77K. Pumping was by a ruby laser operated in normal and giant pulse regimes. The 20-mm-long rod with a 5-mm diameter had silver and dielectric coatings (reflection coefficient of the coating was 95%). In the normal pulsed operating regime the threshold pump power was 0.1 j. The spike pattern of the $CaF_2:Dy^{2+}$ laser output was similar to that of the ruby laser and the spikes appeared not later than 10^{-6} sec after their appearance in the ruby laser output. This indicates the possibility of modulating with a frequency not less than 1 megagigahertz by means of light excitation using, for example, semiconductor lasers. No spikes were observed at a resolution of $\sim 10^{-7}$ sec when excitation was

Card 1/2

L 1772-66

ACCESSION NR: AP5024687

by a ruby laser output which was also free of spikes. The temperature variation of the threshold with the temperature showed that room-temperature operation of the $CaF_2:Dy^{2+}$ laser was very unlikely, due to broadening of the lower laser line with the temperature. Generation was also achieved when $CaF_2:Dy^{2+}$ was excited by several 0.5-j giant pulses of ~30 nanosec duration, when the giant pulses followed one another after 100—200 μsec. The first pulse from a ruby laser resulted in the appearance of a few spikes the intensity of which was 2 orders of magnitude smaller than that of the exciting pulse. The second and third giant pulses produced giant pulses in $CaF_2:Dy^{2+}$ (pulse duration 30—40 nanosec) with the first pulse delayed by 100—200 nanosec and the second, by 30—40 nanosec. The failure to achieve laser action by a single giant pulse is explained. Orig. art. has: 3 figures.

[CS]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

SUBMITTED: 19Feb65 ENCL: 00 SUB CODE: EC, OP

NO REF SOV: 003 OTHER: 001 ATD PRESS: 4111

Card 2/2

PROKHOROV, A.M., laureat Nobelovskoy premii po fizike

Quantum electronics. Priroda 54 no.5:37-42 My '65.
(MIRA 18:5)

1. Chlen-korrespondent AN SSSR.

L 20470-66 EWT(1) IJP(c) GG

ACC NR: AP6012070 SOURCE CODE: UR/0053/65/085/004/0599/0604

AUTHOR: Prokhorov, A. M.

ORG: none 21

TITLE: Quantum electronics

24
B

SOURCE: Uspekhi fizicheskikh nauk, v. 85, no. 4, 1965, 599-604

TOPIC TAGS: quantum electronics

ABSTRACT: A reprint of a lecture read at the presentation of the Nobel prize in December, 1964, this article is a general presentation of the principles and history of quantum electronics. Although Einstein predicted the phenomenon of induction radiation in 1917, the beginning of the age of quantum electronics actually began, the author states, in the winter of 1954-55 with the presentation of the direct theoretical bases of the science. Basic formulas are presented for the coefficient of absorption in a quantum amplifier, which operates on the principle of light emission from atoms in an excited state upon external perturbation. The author states that it would have been possible to create lasers in 1940, had scientists been working on the problem. The theoretical work on energy levels, radio theory (for questions of amplification, resonance, etc.) and construction of volume resonators were all known. The creation of a laser operating on selected frequencies is predicted. Orig. art. has: 6 formulas. [JPRS]

SUB CODE: 20 / SUBM DATE: none / ORIG REF: 007 / OTH REF: 008

Card 1/1 BK UDC: 621.375.9

TITLE: Calcium fluoride laser doped with doubly ionized dysprosium

SOURCE: AN SSSR. Doklady, v. 161, no. 4, 1965, 806-809

TOPIC TAGS: fluorite laser, luminescence spectrum, absorption spectrum laser, calcium fluoride laser, laser oscillation

ABSTRACT: Fluorite crystals, 70—80 mm long and 7—10 mm in diameter with different concentrations of Dy^{3+} (0.05, 0.1, 0.2, 0.3, and 0.5%), were prepared in the single-crystal laboratory of the Physics Institute AN SSSR. Gamma-irradiation at about 10^8 r converted the trivalent dysprosium into divalent. The luminescence and absorption spectra of the resultant crystals were first measured. The absorption spectrum was found to consist of a strong absorption band from 2300 to 4900 Å, and three weaker and narrower bands, with maxima at 5800, 7150, and 9100 Å. Pumping at any of these three frequencies leads to strong luminescence in the 2.3—2.6 μ range. The most intense luminescence occurred at 2.36 μ.

L 41786-65

ACCESSION NR: AP5010827

The laser-operation threshold was measured under pulsed conditions and was found to be about 25 J. The duration of luminescence was approximately 18—26 msec. Laser operation in the continuous mode was made at the supercooled liquid nitrogen temperature. The continuous generation line width was measured with a Fabry-Perot interferometer, the spectrum being scanned by varying the pressure inside the interferometer plates. The results show that the generation line width does not exceed 0.01 cm^{-1}. Narrower lines are expected at the temperatures of liquid neon and helium, and tests to determine this are being planned. It is pointed out in conclusion that a line width of 0.01 cm^{-1} is the narrowest ever attained for solid-state lasers. Orig. art. has: 3 figures.

[02]

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute, AN SSSR)

SUBMITTED: 10Jul64 ENCL: 00 SUB CODE: EC, SS

NO REF SOV: 003 OTHER: 003 ATD PRESS: 3257

EWT(l)/EWT(m)/EEC(t)/FBD/EWP(b)/T/EWA(m)-2/EWP(t) Pf-4/Pi-4/Pl-4/Pm-4/Pn-4/Po-4/
Pr-4/Ps-4/Pu-4/Peb SCTB/IJP(c) WG/JD/JW/JG

ACCESSION NR: AP5011526 UR/0020/65/161/005/1063/1064

AUTHOR: Kaminskiy, A. A.; Kornilyenko, L. S.; Prokhorov, A. M. (Corresponding Member AN SSSR) 85 83

TITLE: Dysprosium-doped fluoride CW laser pumped by solar radiation 27 27

SOURCE: AN SSSR. Doklady, v. 161, no. 5, 1965, 1063-1064

TOPIC TAGS: solid state laser, paramagnetic laser, dysprosium doped fluoride laser, CW laser, solar laser

ABSTRACT: The first Soviet dysprosium-doped fluoride CW laser pumped by solar radiation is discussed. Unlike the first $CaF_2 : Dy^{2+}$ laser developed by Z. J. Kiss et al (J. Appl. Phys. Let., 2, no. 5, 1963, 93), which operated at the liquid neon temperature (27K), the present laser operates at the temperature of liquid nitrogen (77K). The experiments with the new laser were conducted at noon, under a cloudless sky in Moscow during the period 20—30 August 1964. The generation, which occurred in the 4f—5d absorption band from 25,000 to 10,000 cm^{-1}, corresponded to the $^5I_7 \rightarrow {}^5I_8$ transition which terminated at a level approximately 35 cm^{-1} above ground level. The solar rad-

Card 1/2

L 49292-65

ACCESSION NR: AP5011526

3

iation was focused by a standard glass, aluminum-coated mirror ~450 mm in diameter to a spot ~10 mm in diameter. A more efficient transmission of solar radiation into the crystal was achieved by a conical condenser made of optically uniform K8 glass or fluoride to which the active crystal (26 x 3 x 4 mm) was attached. The ends of the resonator were fitted with two parallel (not less than 15") silver mirrors, one mirror being ~3% reflective. The condenser and crystal were kept in a cryostat with pure liquid nitrogen. Since the effective area of the mirror was 1500 cm^2 the laser could be operated in a near-threshold state. Laser action was interrupted when the mirror was partially darkened. The preliminary laboratory data show that for a laser pumped by a DKSSh-type xenon lamp, laser wavelength was 2.3590 ± 10 Å. The power developed by the solar laser was estimated at several microwatts. Orig. art. has: 2 figures. [YK]

ASSOCIATION: Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova (Nuclear Physics Institute of the Moscow State University); Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences, SSSR)

Card 1/2

ACC NR: AP5026978 SOURCE CODE: UR/0020/65/164/005/1012/1015

AUTHOR: Konyukhov, V. K.; Kulevskiy, L. A.; Prokhorov, A. M.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: A cadmium sulfide laser using two-photon excitation from a ruby laser

SOURCE: AN SSSR. Doklady, v. 164, no. 5, 1965, 1012-1015

TOPIC TAGS: laser, semiconductor laser, nonlinear optics, two photon absorption

ABSTRACT: A CdS 5 x 3 x 3 mm laser forming a Fabry-Perot cavity was excited by focused radiation from a 50 Mw Q-switched ruby laser. The emission spectrum of CdS was investigated at flux densities of 20, 40, 200, and 500 Mv/cm^2 with laser action occurring at 500 Mw (see Fig. 1). In addition to considerable narrowing, an interference pattern was obtained and a beam directivity of ~10° above the threshold was observed. The oscillograph trace of CdS laser emission was of the same shape as that of the exciting light at all excitation levels; however, the duration of the bell-shaped trace was 50% shorter than that from the ruby laser. This was attributed to the fact that the power absorbed shows a quadratic dependence on the incident power. The two-photon coefficient of absorption of radiation at $\lambda = 695$ μ was measured at 300K and found to be proportional to the flux density of incident radiation (0.2, 0.5, and 1.1 cm at flux densities of 10, 25, and 55 Mw, respectively). Using

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UDC: 535.89

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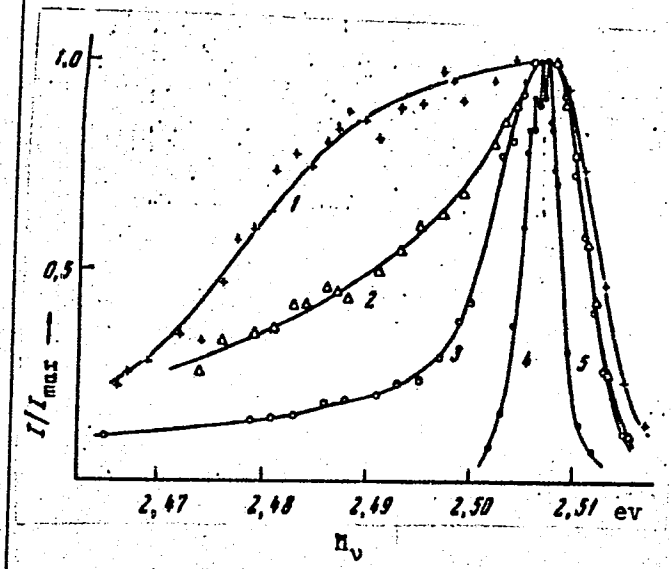
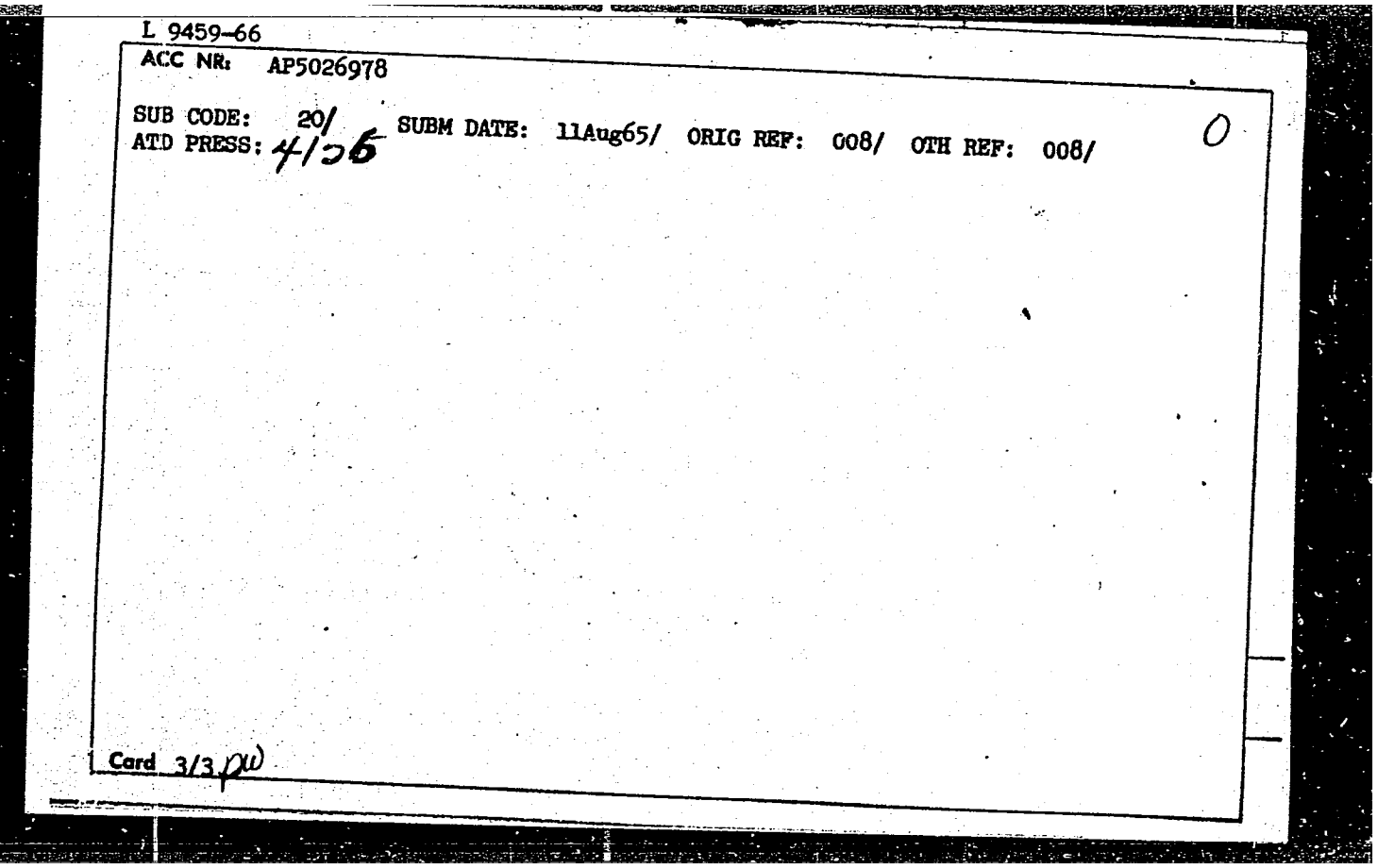


Fig. 1. The emission spectrum of CdS excited by a ruby laser

Flux density of: 1 - 20 Mv/cm^2; 2 - 40 Mw/cm^2; 3 - 200 Mv/cm^2; 4 - 500 Mw/cm^2. The radiation was polarized with E perpendicular to C.

the value of 10 cm^{-1} for the two-photon coefficient of absorption at 500 Mw the hole electron pair creation was calculated to be 10^{27}—10^{28} pair/cm^3 sec. This is of the order of the magnitude of pair generation required to attain laser action in electron-beam-pumped CdS. Orig. art. has: 2 figures.

[CS]



L 9459-66
ACC NR: AP5026978

SUB CODE: 20/ SUBM DATE: 11Aug65/ ORIG REF: 008/ OTH REF: 008/ 0
ATD PRESS: 4156

Card 3/3 pw

L 10949-66 EBD/EWT(l)/EWP(e)/EWT(m)/EEC(k)-2/T/EWP(t)/EWP(k)/EWP(b)/EWA(m)-2/EWA(h)
ACC NR: AP6002423 SCIB/IJP(c) SOURCE CODE: UR/0020/65/165/005/1056/1058
IG/JD/WH

AUTHOR: Konyukhov, V. K.; Kulevskiy, L. A.; Kostin, V. V.; Murina, T. M.; Prokhorov, A. M. (Corresponding member AN SSSR)

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: A giant-pulse $CaF_2:Dy^{2+}$ laser with continuous pumping

SOURCE: AN SSSR. Doklady, v. 165, no. 5, 1965, 1056-1058

TOPIC TAGS: giant pulse laser, dysprosium, calcium fluoride, xenon lamp, ~~pumping~~ calcium fluoride, crystal, laser pumping, laser beam, laser

ABSTRACT: The generation of repeating giant pulses at 2.36 μ is reported in $CaF_2:Dy^{2+}$ pumped continuously by xenon lamps. Such pulses were first achieved in $CaF_2:Dy^{2+}$ by Ye. M. Zolotov, A. M. Prokhorov, and G. P. Shipulo (ZhETF, v. 49, no. 9, 720, 1965), who used ruby laser pumping. A similar method of generating giant pulses in YAlG:Nd was used by J. E. Gausic, M. L. Hensel, and R. G. Smith (Appl. Phys. Lett., 6, no. 9, 175, 1965). The laser system used in the present investigation (Fig. 1) consisted of a cylindrical dysprosium-doped calcium fluoride crystal 70 mm long and 7 mm in diameter with plane-parallel ends. The concentration of Dy^{2+} in CaF_2 was $\sim 10^{17}$ cm^{-3}. The crystal was placed in a dewar, where it was cooled by circulating liquid nitrogen. The pumping was provided by two cw xenon lamps placed together with a dewar in a tight condenser. An internal multilayer dielectric mirror with a re-

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flectivity of approximately 100% was used on one end of the resonator, whose output was Q-switched by means of a rotating (50--500 cps) prism with total internal reflection. The laser beam was incident (at 23°) at a plane-parallel quartz plate and directed at a calorimeter and a liquid-nitrogen-cooled InSb photodiode with a time-resolution of $20 \cdot 10^{-9}$ sec. The time-dependent emission intensity was recorded by

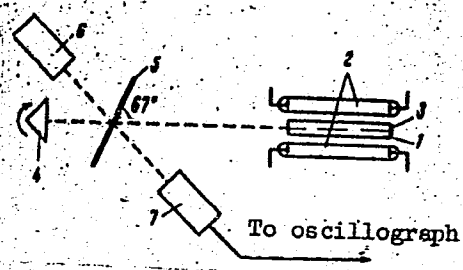

Fig. 1. Schematic of the laser system

1 - $CaF_2:Dy^{2+}$ crystal; 2 - continuous pumping xenon lamps; 3 - multilayer dielectric mirror; 4 - rotating prism with total internal reflection; 5 - plane-parallel quartz plate; 6 - calorimeter; 7 - InSb photodiode.

means of an InSb photodiode and DEO-1 and S1-11 oscillographs. The mean intensity in both directions (see Fig. 1) was 0.05 w for both fixed and rotating (at 200 cps) prisms. This indicates that the rotation frequency of the prism was near optimal. The duration and repetition rate of the giant pulses were 1.2×10^{-7} sec (calculated value was 1.05×10^{-7}) and 200 cps, respectively, resulting in a peak power of 2×10^3 w. The proposed high-intensity laser can be used in studies of two-photon excitation of semiconductors with a narrow forbidden gap. Orig. art. has: 2 figures. [YK]

SUB CODE: 20 / SUBM DATE: 02Sep65/ ORIG REF: 003/ OTH REF: 005/ ATD PRESS: 4170

Card 2/2

L 46107-66 EWT(l)/EWT(m)/T/EWP(t)/ETI LIP(c) JD/JW/GG

ACC NR: AP6023908 SOURCE CODE: UR/0363/66/002/007/1161/1170

AUTHOR: Voron'ko, Yu. K.; Kaminskiy, A. A.; Osiko, V. V.; Prokhorov, A. M.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR); Institute of Crystallography, Academy of Sciences, SSSR (Institut kristallografii Akademii nauk SSSR)

TITLE: New type of crystals for lasers with optical excitation

SOURCE: AN SSSR. Izv. Neorg materialy, v. 2, no. 7, 1966, 1161-1170

56
55
B

TOPIC TAGS: fluoride, neodymium, laser optic material, lanthanum compound, cerium compound, yttrium compound, barium compound, strontium compound, calcium fluoride, mixed crystal

ABSTRACT: The paper reports new results obtained from a study of the optical properties and induced emission at 300°K of a group of crystals of mixed fluorides containing a neodymium admixture. All the crystals contained from 0.5 to 2.0% Nd^{3+} and had the following composition: CaF_2-YF_3 (1, 2, 3, 7%); CaF_2-CeF_3 (7%); SrF_2-LaF_3 (30%); BaF_2-LaF_3 (30%). The absorption and luminescence spectra of the crystals at 300 and 77°K were studied. The synthesized mixed fluorides constitute a new type of laser materials. Structurally they are typical crystals, but from the standpoint of their spectral properties, they occupy an intermediate position between crystals and glasses. The thresholds of generation excitation were found to be much lower than in crystals

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UDC: 546.161:548.55

L 45107-66
ACC NR: AP6023908

of pure fluorides, and the efficiency was found to be several times higher. The working concentrations of neodymium in the mixed fluorides are several times higher than in CaF_2-Nd^{3+}. The weaker concentration quenching is apparently due to the removal of the structural degeneracy of the optical centers. Migration of the excitation energy between various groups of In^{3+} optical centers is possible in the mixed fluoride crystals. The latter may prove effective as sources of excitation for semiconductor lasers. Orig. art. has: 7 figures and 2 tables.

SUB CODE: 20/ SUBM DATE: 30Dec65/ ORIG REF: 015/ OTH REF: 010

Card 2/2 JS

L 28439-66 EWT(1) JXT(EX)

ACC NR: AP6018701 SOURCE CODE: UR/0386/66/003/011/0436/0439

AUTHOR: Konyukhov, V. K.; Prokhorov, A. M.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

66
64
B

TITLE: Population inversion in adiabatic expansion of a gas mixture

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 11, 1966, 436-439

TOPIC TAGS: nitrogen, carbon dioxide, gas laser, adiabatic expansion, nuclear energy level, relaxation process, excited state

ABSTRACT: The authors show that in some mixtures of molecular gases population inversion states in the vibrational levels are produced and exist for some time following adiabatic expansion of the gas, provided the molecules of the mixture differ noticeably in their vibrational relaxation times and are capable of exchanging vibrational-relaxation energy. Equations are presented for the change in the number of molecules of the working gas at three vibrational levels, one of which (the third) can exchange vibrational excitation with the upper level of the carrier molecule, from which the conditions for level inversion are obtained. As a specific example it is shown that in the case of a mixture of nitrogen and carbon dioxide adiabatic expansion makes possible a population inversion between the levels (0 $0^0$1) and ($10^0$0) of the CO_2 molecule. For initial and final temperatures of 1000 and 300K, the

Card 1/2

L 28439-66
ACC NR: AP6018701

2

estimated inversion is about 1%, with a maximum 3.5%. It is also noted that a continuous mode of adiabatic expansion can be realized by passing the gas through a supersonic nozzle. The authors thank L. A. Kulevskiy and V. M. Marchenko for discussions. Orig. art. has: 1 figure and 3 formulas. [02]

SUB CODE: 20/ SUBM DATE: 31Mar66 ORIG REF: 001/ OTH REF: 005/ ATD PRESS: 5006

Card 2/2 PB

L 29732-66 EWC(f) EWP(e) AT

ACC NR: AP6018343 SOURCE CODE: GE/0036/66/006/001/0001/0008

AUTHOR: Mandel'shtam, S. L.; Pashinin, P. P.; Prokhorov, A. M.; Rayzer, Yu. P.; Sukhodrev, N. K. 77 B

ORG: Physics Institute im. P. N. Lebedev, AN SSSR, Moscow (Fizicheskiy Institut AN SSSR)

TITLE: Investigation of a spark in air formed during focusing of emission from a laser

SOURCE: Beitrage aus der Plasma Physik, v. 6, no. 1, 1966, 1-8

TOPIC TAGS: ~~laser, nonlinear optics, air breakdown~~ laser emission, plasma decay, laser beam, ruby laser, plasma temperature, line shift, Doppler shift

ABSTRACT: An experimental investigation was conducted of air breakdown produced by a Q-switched ruby laser (pulse energy 2—2.5 j, pulse duration 30 μsec). The authors analyzed the last two stages of the breakdown process, which according to them can be subdivided into the following three stages: 1) the breakdown stage (rapid increase in the number of free electrons); 2) the quasi-stationary stage (dense plasma is maintained by the absorption of energy of the laser beam); and 3) the afterglow stage (decay of plasma after the laser pulse ceases). From the soft x-ray emission of the plasma (at about 10 Å) due to continuous recombination of N^{5+}, N^{6+}, N^{7+}, O^{6+}, O^{7+}, O^{8+} the maximum electronic temperature of the plasma in the breakdown region was determined to be ≈ 60 ev. The width of the laser line scattered by the plasma during the second stage was determined to be ≈ 1—1.4 Å; the shifting of the line was found to vary at different positions near the focal region of the laser beam with the maximum shift

Card 1/2

L 29732-66

ACC NR: AP6018343

≈ 3.2 Å (the focal length of the lens was 55 mm). The displacement of the ionized region toward the laser beam causing the Doppler shift of the line was attributed to the formation of a shock wave which intensely absorbed the laser light. A study of the third stage by high-speed photography (655,000 frames/sec) showed that the breakdown region expands during the first 3—5 μsec after the passage of the pulse and then decays during the next 30—40 μsec. The spectrum of the plasma in the visible range during the third stage showed the presence of NII, DII, and NI and H2. The electronic temperature during this stage was estimated to be about 3—6 x 10^4K. Orig. art. has: 6 figures, 6 formulas, and 1 table. [CS]

SUB CODE: 20/ SUBM DATE: 08Jun65/ ORIG REF: 010/ OTH REF: 010/ ATD PRESS: 5113

Card 2/2

L 22402-66 FBD/EWT(l)/EEC(k)-2/T/EWP(k)/EWA(h) IJP(c) WG

ACC NR: AP6007503 SOURCE CODE: UR/0109/66/011/002/0267/0270

AUTHOR: Karlov, N. V.; Prokhorov, A. M.

ORG: Institute of Physics, AN SSSR (Fizicheskiy institut AN SSSR) 1/9

TITLE: Regenerated TW quantum amplifiers 25 8

SOURCE: Radiotekhnika i elektronika, v. 11, no. 2, 1966, 267-270

TOPIC TAGS: laser, quantum amplifier

ABSTRACT: The characteristics of (a) a straight-through amplifier with a Fabry-Perot resonator, (b) a straight-through unidirectional amplifier in which the radiation propagates circularly, and (c) a circulator-type reflex amplifier are considered. It is assumed that the active-substance line width substantially exceeds the resonator passband. Formulas are developed for calculating these parameters: field-strength gain; power gain; gain instability; and reflection factor required for realizing a specified gain. It is found that: (1) The regeneration of (a) is stronger than that of (b); hence, other conditions being equal, (a) is more stable and has a wider band than (b); (2) The (c) amplifier has advantages over the two others as far as its stability and bandwidth are concerned. The above results hold true not only for resonator-type lasers but also for regenerated quantum r-f TW-amplifiers. Orig. art. has: 25 formulas.

SUB CODE: 09 / SUBM DATE: 24Nov64 / ORIG REF: 002 / OTH REF: 002 [03]

Card 1/1 Hw

UDC: 621.378.5

L 23319-66 FBD/EWT(l)/EWT(m)/EEC(k)-2/T/EWP(k)/EWA(h) IJP(c) WG

ACC NR: AP6011581 SOURCE CODE: UR/0051/66/020/003/0531/0532

AUTHOR: Konyukhov, V. K.; Marchenko, V. M.; Prokhorov, A. M.

ORG: none

TITLE: $CaF_2:Sm^{2+}$ laser pumped by a ruby laser

SOURCE: Optika i spektroskopiya, v. 20, no. 3, 1966, 531-532

TOPIC TAGS: laser, solid state laser, stimulated emission

ABSTRACT: A $CaF_2:Sm^{2+}$ laser pumped by a Q-switched ruby laser operating at 65—90K is described. The monocrystals of $CaF_2:Sm^{2+}$, grown by several different methods, had silver or dielectric coatings. The output of the exciting ruby laser was 0.5 j and the pulse duration 50 nsec. The oscillation threshold of the $CaF_2:Sm^{2+}$ was achieved when the output of the exciting ruby laser was 0.1 j. The spectrum of the $CaF_2:Sm^{2+}$ laser consisted of three lines, at 0.708, 0.720, and 0.729 μ. When the temperature was lowered to 65K only the line at 0.708 μ remained. The oscillation pulse had the same shape as the pump pulse. The energy efficiency of the system at 77K was determined to be 0.13. Orig. art. has: 4 figures. [CS]

SUB CODE: 20/ SUBM DATE: 23Sep65/ ORIG REF: 003/ OTH REF: 004/ ATD PRESS: 4232

Card 1/1 UDC: 621.375.9:535

L 04564-67 EWT(l)/EWT(m)/EWP(t)/ETI IJP(c) JD/JW/JG

ACC NR: AP6032472 SOURCE CODE: UR/0056/66/051/003/0773/0776

AUTHOR: Dzhibladze, M. I.; Zvereva, G. A.; Kostin, V. V.; Murina, T. M.; Prokhorov, A. M.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Investigation of the luminescence line width and of the temperature shift of the continuous generation frequency of Dy^{2+} in CaF_2

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 51, no. 3, 1966, 773-776

TOPIC TAGS: laser, spectroscopy, solid state laser, paramagnetic laser, cw laser, fluorite, dysprosium

ABSTRACT: In view of the possible use of CaF_2 crystals activated with divalent dysprosium as laser rods at 2.36 μ wavelength, the authors have calculated the probabilities of the nonradiative transitions of the Dy^{2+} ion in CaF_2 which cause the homogeneous broadening of the luminescence lines, and also investigated the temperature dependence of the frequency shift of a $Dy^{2+}:CaF_2$ cw laser in the vicinity of 78K. It is shown that the broadening of the luminescence line (the transition $7T_1^{(2)} \rightarrow 8T_2^{(2)}$) is determined essentially by the lifetime of the lower level $8T_2^{(2)}$, since the probability of the nonradiative transition from this level is of the order of 10^{10} sec^{-1}. The nonradiative transitions from the lower level, $8T_2^{(2)} \rightarrow 8E^{(2)}$ and $8T_2^{(2)} \rightarrow 8T_1^{(1)}$,

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determined in the harmonic approximation by perturbation theory, had probabilities 6.61×10^9 and 7.13×10^9 sec^{-1}, respectively at 0°K. The temperature dependence of the shift of the cw frequency, measured by means of a Fabry-Perot interferometer with a procedure described earlier (DAN SSSR v. 161, 806, 1965), is found to correspond to a shift of 0.0095 ± 0.0025 cm^{-1} per degree, which is approximately double the value calculated from the change in the crystal field with changing temperature. The discrepancy is attributed to the fact that the point-charge model of the crystal field is not a good approximation for $Dy^{2+}:CaF_2$. Orig. art. has: 2 figures, 4 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 05Apr66/ ORIG REF: 004/ OTH REF: 004/ ATD PRESS: 5100

Card 2/2 vmb

ACC NR: AP7000401 SOURCE CODE: UR/0386/66/004/009/0373/0376

AUTHOR: Vinogradov, Ye. A.; Irisova, N. A.; Mandel'shtam, T. S.; Prokhorov, A. M.; Shmaonov, T. A.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Resonance absorption of the V^{3+} ion in corundum at 1.21 mm wavelength

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 9, 1966, 373-376

TOPIC TAGS: corundum, vanadium, resonance absorption, low temperature research, microwave spectroscopy, hyperfine structure

ABSTRACT: The authors report an experimental investigation of resonance absorption of the V^{3+} ion in corundum at wavelength $\lambda \sim 1.21$ mm and at liquid-helium temperature in magnetic fields from 0 to 5 kOe. The observed absorption corresponded to transitions from the lower level corresponding to the singlet state $S_{Z'} = 0$ to the levels of the higher doublet ($S_{Z'} = \pm 1$). The resonance absorption of the V^{3+} (~0.1%) in corundum was measured with a quasioptical feed-through spectroscope without cavity, which was constructed by the authors. The radiation source was a backward-wave tube generating an average of ~3 mW in the range from 0.83 to 1.35 mm. The microwave power was fed quasioptically to a sample placed in a helium cryostat via teflon windows in the cover. The helium cryostat could be placed between the poles of an electromagnet. Two series

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ACC NR: AP7000401

of measurements were made. In the first, the absorption line was investigated in different constant magnetic fields, including zero field, with the microwave-oscillator frequency continuously variable. In a zero field, two closely-spaced absorption lines were observed, corresponding to transitions from the lower singlet level of the V^{3+} ion to the levels of the doublet $S_z = \pm 1$. The frequencies of the transitions from the lower level to each of the doublet levels were found to be $D_1 = (247.3 \pm 0.3)$ and $D_2 = (248.9 \pm 0.3)$ GHz, and the initial splitting of the doublet was $2E = (1.6 \pm 0.6)$ GHz. The calculated coefficient of resonance absorption of V^{3+} in corundum was $\alpha \geq 0.3$ cm^{-1}. The second series of measurements was made at a number of fixed frequencies with the magnetic field varied from 0 to 5 kOe. The absorption line observed in this case consisted of eight hfs components. The splitting between the singlet and the doublet, equal to 247.8 GHz, coincides within the limits of experimental error with $D = (D_1 + D_2)/2$ determined in the first measurement series. When the external magnetic field tends to zero, the distance between the outermost components yields the upper limit of the initial doublet splitting, $2E \leq 2.1$ GHz. The authors are grateful to V. Kh. Sarkisov, director of the Corundum Laboratory of Kirivokanskiy khimkombinat, for supplying the investigated sample. Orig. art. has: 3 figures.

SUB CODE: 20/ SUBM DATE: 28Jul66/ ORIG REF: 002/ OTH REF: 005
ATD PRESS: 5107

Card 2/2

ACC NR: AP7005580 SOURCE CODE: UR/0020/67/172/002/0309/0312

AUTHOR: Yershov, B.V.; Pimenov, Yu.P.; Fedorov, V.B.; Prokhorov, A.M. (Academician)

ORG: Physics Institute im. P.N. Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Two-photon absorption of CaF_2: Ho^{+++} crystals

SOURCE: AN SSSR. Doklady, v. 172, no. 2, 1967, 309-312

TOPIC TAGS: calcium fluoride, holmium, two photon absorption, luminescence, crystal impurity, PHOTON, LASER RADIATION

ABSTRACT:

An investigation was made of artificially grown CaF_2 crystals containing 0.3 wt% Ho^{+++}. The samples were cylindrical, 1 cm in diameter and 4—5 cm long. They were irradiated, either separately or simultaneously, by a ruby laser and an Nd-glass laser with pulses of 7.8 and 11.3 joules, respectively. Pulse duration was in the millisecond range. The two-photon processes were detected by the green luminescence (λ = 5512 Å) arising after preliminary nonradiative transition from a two-photon-excited absorption level to the initial level $^5S_2$ of this line. The observed two-photon transitions were of three kinds, corresponding respectively to the absorp-

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ACC NR: AP7005580

tion of 2 ruby photons, 2 Nd-glass photons, and 1 ruby photon and 1 Nd-glass photon. As in experiments on $CaF_2 : Eu^{++}$, in which two-photon absorption was first reported [W. Kaiser, C. G. B. Garrett, Phys. Rev. Letters, 7, 1961, p. 229], the nonlinearity of intensity relationships was one of the validity criteria for the assumption of a two-photon mechanism: with only one laser luminescence grew with the square of the irradiation intensity; with two lasers, its magnitude was greater than the sum of the separate effects of each laser. Oscillograms showed that the Nd-glass luminescence lagged approximately 10^{-3} sec behind the ruby luminescence, which indicates a relative slowness of the transition from the $^5F_4$ absorption level to the $^5S_2$ initial level of the green line. The relative timing of the laser pulses could be adjusted by selection of a suitable circuitry. Stimulated luminescence of $CaF_2 : Ho^{+++}$ at 77°K was previously demonstrated by Yu. K. Voron'ko, A. A. Kaminskiy, V. V. Osiko, and A. M. Prokhorov (Pis'ma ZhETF, v. 1, no. 1, 1965, p. 5). Orig. art. has: 2 figures. [JM]

SUB CODE: 20/ SUBM DATE: 12Nov66/ ORIG REF: 002/ OTH REF: 003/
ATD PRESS: 5116

Card 2/2

PROKHOROV, A. N.

Building Machinery

Combating dust and smoke in asphalt-concrete mixers. Mekh. stroi., 9. No. 1, 1952.

9. Monthly List of Russian Accessions, Library of Congress, April 1953. Unclassified.

PROKHOROV, A. N.

Dissertation: "Investigation of Some Problems of a Container System for Removing Solid Wastes From Houses." Cand Tech Sci, Academy of Communal Economy imeni K. D. Pamfilov, 31 May 54. Vechernyaya Moskva, Moscow, 21 May 54.

SO: SUM 284, 26 Nov 1954

GRISHIN, B.M., inzh.; PROKHOROV, A.N., inzh.

Erection of monolithic reinforced concrete shells for water-cooling towers without scaffolding. Energ.stroi. no.4:56-58 '58. (MIRA 12:2)

1. Moskovskiy filial Orgenergostroya.
(Concrete construction)

PROKHOROV, A.N., kand.tekhn.nauk

Using vibrators in preparing asphalt-concrete and cement-concrete mixtures. Stroi.i dor.mashinostr. 3 no.12:6-10 D '58. (MIRA 11:12)

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PROKHOROV, A.N., inzh.

Experience in the erection of reinforced concrete walls in the construction of the Beloyarsk atomic electric power plant. Energ.stroi. no.25:39-41 '61. (MIRA 15:4)

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BAKHMETOVA, T.Ye.; DOVGER, F.F.[deceased]; SMIRNOV, P.A.; PROKHOROV, A.N.; SHUMAKOV, I.A.; MIROSHINA, Yu.N.; SHAGALOV, Ye.S., red.;

[Album of sketches of stock equipment for the erection of structural elements]Al'bom chertezhei inventarnykh prispособlenii dlia vozvedeniia stroitel'nykh konstruktsii. Moskva. Pt.1.[Cradles, stagings, ladders, guard rails. Approved by a resolution of the technical administration No.163 of Dec. 30, 1959]Liul'ki, ploshchadki, lestnitsy, ograzhdeniia. Utverzhden resheniem tekhnicheskogo upravleniia No.163 ot 30 dekabria 1959 g. 1962. 141 p. (MIRA 15:10)

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Increasing the life of trolley-bus springs. Sbor.nauch.rab.AKKH no.13:236-264 '62. (MIRA 16:4)
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